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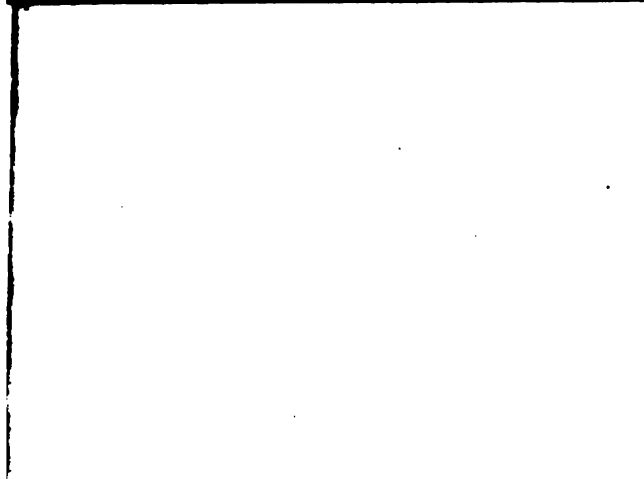


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KNOWLEDGE IS POWER:

A VIEW OF THE
PRODUCTIVE FORCES OF MODERN SOCIETY
AND THE RESULTS OF
LABOR, CAPITAL AND SKILL.

BY
CHARLES KNIGHT.

Revised and Edited, with Additions,

BY
DAVID A. WELLS, A. M.,
EDITOR "ANNUAL SCIENTIFIC DISCOVERY," "YEAR-BOOK OF AGRICULTURE," "FAMILIAR
SCIENCE," ETC. ETC.

ILLUSTRATED WITH NUMEROUS ENGRAVINGS.

"The empire of man over material things has for its only foundation the sciences and the
arts. — BACON.

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EDITOR'S PREFACE.

THIS work, entitled "Knowledge is Power," was first published in England early in the year 1855. The author, Mr. Charles Knight, is well known to the reading public of Great Britain and the United States, as an eminent London publisher, and as the editor and author of the "Penny Magazine," "Penny Cyclopaedia," "The Results of Machinery," and other popular works.

The design of "Knowledge is Power" is to set forth in a concise and familiar manner the nature and variety of the various productive forces of modern society, together with the results which have been attained to by the union of labor, capital and skill; the whole illustrated by numerous examples and statistics, derived in great part from the history of the civilization and progress of the Anglo-Saxon races, and from their present condition. The author, in the preparation of the work, having had solely in view the instruction and requirements of the English public, introduced many illustrative examples, statistics and engravings, which were both inapplicable and foreign to the actual condition and past history of industrial progress in the United States. To render, therefore, the book more useful, and in all respects intelligible to the American reader, a careful revision and re-editing were considered necessary.

In the execution of this requirement the Editor has strictly followed the original plan of the author, as the principles laid down,

and the subjects treated of, are general in their nature, and confined to no section of any country, or to any particular nation. Some entirely new chapters have been added, others re-written in great part, and much industrial, historical, and statistical matter, which was exclusively English and local, has been omitted, and replaced with information of a like character drawn from American sources. The majority of the original engravings with which the book was illustrated, have, for a similar reason, been replaced by others.

If it be objected to by any, that the work, notwithstanding its revision, is too English in character, it may be urged in reply, that as respects the past, British history, previous to the eighteenth century, is the common heritage of both the Englishman and the American, and that their ancestors were also our ancestors; for the present, we need not remind the reader that the industrial pursuits of both countries are so closely associated and united, that whatever pertains to the interests of one, also affects in a greater or less degree the interests of the other.

"Without attempting," says Mr. Knight, "to give to the volume the formal shape of a treatise on political economy, it is the wish of the author to convey the broad parts of his subject in a somewhat desultory manner, but one which is not altogether devoid of logical arrangement. He desires especially to be understood by *the young*; for upon their right appreciation of the principles which govern society will depend much of the security and happiness of our own and the coming time. The danger of our present period of transition is, that theory should expect too much, and that practice should do too little in the amelioration of the condition of the people."

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KNOWLEDGE IS POWER.

CHAPTER I.

ROUSSEAU'S OPINION ON OBSERVING.—FAMILIARITY WITH THE DETAILS OF A PURSUIT
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OF NATIONS AND INDIVIDUALS NOT DEPENDENT ON ACCIDENT.—MAN AMENABLE
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WEALTH, DEFINITION OF.—OBJECT OF THE PRESENT WORK.—OPPOSITION TO
LABOR-*SAVING* MACHINERY.—WHITWORTH'S REPORT.—FULTON'S STEAMBOAT.—
ERICSSON.—WHAT IS SCIENCE.—CAPITAL.—MONEY.—EXCHANGES.—DIVISION OF
LABOR.—GENERAL SUMMARY.

It has been wisely said by an eminent French writer (Rousseau) who scattered sound and foolish opinions with a nearly equal hand, "that it requires a great deal of philosophy to observe once what may be seen every day." This remark is particularly applicable to those branches of knowledge which relate to, and are intimately connected with, the pursuits of every-day life—to the various occupations and employments which have their origin in the wants of man, and are the means and agencies by which those wants are supplied and satisfied.

Familiarity with the details of any subject or business does not necessarily presuppose or require an acquaintance with the principles upon which such subject or business is founded—nay, more—familiarity generally gives rise to indifference. If a particular result is satisfactory to a pecu-

niary degree, the sluggish mind is too apt to rest satisfied, without caring to inquire as to the cause by which the result is produced, or whether it is capable of further improvement. The gun-smith may accurately fashion, day by day, in continued routine, a particular portion of the musket, without knowing or caring to know the reason why he is required to shape the metal to a particular form, or the relation which such form sustains to the whole. The gun-smith may be an excellent workman and a good citizen, but an unthinking, unreflecting mind renders him a machine—no better, and in some respects inferior to his fellow-machine that, with muscles of iron and sinews of steel, fashions the rough block into the complicated and irregular gun-stock more accurately and more rapidly than the human machine could achieve the same labor.

This indifference to causes and first principles, which we unhesitatingly condemn in the unreflecting mechanic, finds a parallel with most men in all the ordinary transactions and labors of life which we call business. The majority of civilized, and even educated men, are content with the fact that a certain amount of labor, properly directed, produces a certain gain, and that gain or its representative, money, will produce in exchange the luxuries and necessities of life; beyond this few seek to inquire or to comprehend those laws and principles which underlie every transaction involving labor and exchange, production and consumption, and in accordance with which alone industrial effort is able to produce its greatest profitable effect. It is no chance system that returns to the Hindoo artizan a penny and to the American laborer a dollar for their daily toil, that makes Mexico, with its mineral wealth, poor, and New England, with its granite and ice, rich, that bids the elements in one country become subservient to the wants of man, and in another to sport idly and run to waste—it is no acci-

dental caprice of nature that has given rise to these and other analogous differences in the condition of various individuals and societies, but a right understanding and appreciation, or the ignorance and abuse of those rules and conditions which govern and control the application of human industry to the original materials that the Creator has spread around us.

Man, whether existing alone, as the sole tenant of an uninhabited island, or in society, as a member of a body politic, is amenable to and under the guidance of certain laws, which nature has fixed as the conditions of his being. Nature and revelation assert that labor is necessary for subsistence. "In the sweat of thy brow shalt thou eat bread." Instinct teaches both the savage and the civilized man that temperance and freedom from excess are essentials for the preservation of health, and frugality and industry essentials for accumulation of wealth. In addition to natural laws governing the physical well-being of man, society—the association of individuals for mutual benefit—has created other laws, regulating the conditions under which the association shall be maintained, and affixing prescribed rules, in accordance with which each member may, according to his position and ability, best satisfy his wants and improve his condition. That branch of science which presents to our consideration a systematic arrangement of the various laws and conditions which govern the relations of man, whether individual or social, to his wants and desires, we designate as Political Economy.

Man, it has been maintained, has greater natural wants and fewer natural means than any other animal. That his wants are greater, even in the lowest and most degraded type of the species, than the wants of any quadruped—to say nothing of animals lower in the scale of being—there can be no doubt.

"Man, in common with all animals, must sustain his body by nourishment, which is not offered to him freely, as to plants, but must be sought for with exertion. He must take and appropriate the food he finds; but, unlike most animals, he is obliged, even in the most savage state, to store up. He is bound to do this, because, although in part a carnivorous animal, he can not remain so long without food as the animals of prey; he requires a more regular supply; because his body, unaided by weapons or traps, is not adapted for obtaining for him animal food. His children also depend longer upon him for support than the young ones of any other animal upon their parent. The limbs of man, though nimble and of the most perfect organization, are without talons. His mouth does not protrude so that it might be used for attack; his body also is unprotected by either fur or feathers. He is obliged, therefore, to make arms and construct shelter; he must produce, even though he desires nothing more than to live."

But notwithstanding that the wants of man are greater and more numerous than those of most animals, and notwithstanding that his physical organization, unaided by weapons or tools, is ill-adapted for the appropriating of natural supplies, it can not be true that the natural means placed at his disposal by the Creator are feebler or less effective than those of the brutes. He alone is gifted with understanding and mental capacities, the exercise of which, in a variety of ways which no brute intelligence can attain to, is the greatest of all natural means—the *one power*, which enables him to subdue all things to his use.

It is the almost unlimited extent of the wants of man in the social state, and the consequent multiplicity and complexity of his means—both his wants and means in a great degree proceeding from the range of his mental faculties—which have rendered it so difficult to observe and explain the laws

which govern the production, distribution, and consumption of those articles of utility, essential to the subsistence and comfort of the human race, which we call Wealth. It is not more than a century ago that even those who had "a great deal of philosophy" first began to apply themselves to observe "what is seen every day" exercising, in the course of human industry, the greatest influence on the condition and character of individuals and nations. The properties of light were ascertained by Sir Isaac Newton long before men were agreed upon the circumstances which determined the production of a loaf of bread; and the return of a comet after an interval of seventy-six years was pretty accurately foretold by Dr. Halley when legislators were in almost complete ignorance of the principle which regularly brought as many cabbages to market as there were purchasers to demand them.

Since those days immense efforts have been made to determine the great circumstances of our social condition which have such unbounded influence on the welfare of mankind. But, unhappily for themselves and for others, many of every nation still remain in comparative darkness with regard even to the elementary truths which the labors of some of the most acute and benevolent inquirers that the world has produced have succeeded in establishing. Something of this defect may be attributed to the fact that subjects of this nature are considered difficult of comprehension. Even the best educated sometimes shrink from the examination of questions of political economy when presented in their scientific form. Charles Fox said that he could not understand Adam Smith. And yet Adam Smith's "Wealth of Nations" is not generally considered to be a book above the capacity of ordinary intellects. Matters affecting the interests of every human being, and involving a variety of facts having relation to the condition of mankind in every age

and country, are not necessarily, as has been supposed, dry and difficult to understand, and consequently only to be approached by systematic students. On the contrary, the economic principles, which are so intimately connected with the well-being of every State, society, or individual, when considered apart from any particular theory or system, are eminently simple in their nature, admitting of extensive generalizations, and, at the same time, of a regular and systematic classification.

With this belief it is proposed in the following treatise to exhibit the nature of those principles by which Industry, as well as every other exchangeable property, must be governed. To do this clearly, and at the same time thoroughly, it will be necessary to set forth and apply those universal laws, which regulate the exchange which the great bulk of the people are most interested in carrying forward rapidly, certainly, and uninterruptedly—the exchange of labor for capital. No exposition of the laws and principles of political economy can be made at the present day without a special reference to the development of that mighty power which within the last hundred years has become so absorbing and controlling—the Power of Science applied to the Arts, or, in other words, Knowledge. It is not too much to assert that henceforth, Labor must take its absolute direction from that power. It is now the great instrument of Capital. In time, it will be understood and acknowledged, universally that applied science is under all circumstances the most advantageous, and most profitable partner of all labor. That a universal assent, at least among all civilized communities, to a proposition so self-evident, so often inculcated by the wisest of statesmen and philosophers, and so forcibly illustrated by reference to every industrial occupation, should be yet deemed prospective, may be by some regarded as unreasonable. It is, however, to be remembered that it

is only within a comparatively recent period (1830) that great national alarm and anxiety was experienced throughout Great Britain, on account of the rage and opposition manifested by the laboring classes against the introduction of mechanical improvements in agriculture. Large bodies of laborers, assembling together, broke to pieces the thrashing machines, and menaced the proprietors; and in many of the agricultural districts, the spirit of lawless violence prevailed to such an extent that military force was required for its coercion and restraint. Happily this spirit has, in a great measure, passed away. That it is not, however, entirely extinct in Great Britain, may be inferred from the Report of the Committee of the Great Exhibition "On Agricultural Implements," in which we are assured "that the laborers themselves *begin* to regard the tedious work of the flail as too irksome."

The subject is also indirectly alluded to by Mr. Whitworth, in his able report to the British Government on the New York Industrial Exhibition, in which, after pointing out the result of mechanical improvements and invention in the United States, he says, "The results which have been obtained in the United States, by the application of machinery, wherever it has been practicable, to manufactures, are rendered still more remarkable by the fact that combinations to resist its introduction there are unheard of. The workmen hail with satisfaction all mechanical improvements, the importance and value of which, as releasing them from the drudgery of unskilled labor, they are enabled by education to understand and appreciate. With the comparatively superabundant supply of hands in this country, and therefore a proportionate difficulty in obtaining remunerative employment, the working classes have less sympathy with the progress of invention. Their condition is a less favorable one than that of their

American brethren for forming a just and unprejudiced estimate of the influence which the introduction of machinery is calculated to exercise on their state and prospects. I can not resist the conclusion, however, that the different views taken by our operatives and those of the United States upon this subject are determined by other and powerful causes besides those dependent on the supply of labor in the two countries. The principles which ought to regulate the relations between the employer and the employed seem to be thoroughly understood and appreciated in the United States; and while the law of limited liability affords the most ample facilities for the investment of capital in business, the intelligent and educated artisan is left equally free to earn all that he can, by making the best use of his hands, without let or hinderance by his fellows."

Notwithstanding this complimentary notice of the American mechanic by Mr. Whitworth, it can not be denied that something of the same spirit which leads the British artizan to combine against the introduction of labor-saving machinery, prevails in this country, even in New England, the center of educational movements. It is the testimony of almost every inventor of an original machine or process in the United States, that one of the greatest difficulties he has had to encounter in the development of his discovery, has arisen from the secret opposition and indifference of the persons who are to use or apply it.

"When I was building my first steamboat in New York," says Robert Fulton, "the project was viewed by the public either with indifference or contempt, as a visionary scheme. My friends, indeed, were civil, but they were shy, they listened with patience to my explanations, but with a settled cast of incredulity on their countenances. As I had occasion to pass daily to and from the building-yard, while my boat was in progress, I have often loitered, unknown, near

the idle groups of strangers, gathering in little circles, and heard various inquiries as to the object of the new vehicle. The language was uniformly that of scorn, or sneer, or ridicule. The loud laugh often rose at my expense; the dry jest; the wise calculations of losses and expenditures; the dull, but endless repetition of Fulton's folly. Never did a single encouraging remark, a bright hope, a warm wish cross my path. Silence itself was but politeness, vailing its doubts, or hiding its reproaches."

The experience of Ericsson, in 1854, was not dissimilar from that of Fulton, in 1807. Although a difference in the tone of public sentiment was manifest, yet from the ridicule and attacks, not unfrequent, from individuals and a portion of the press, it might have been inferred that the introducer of the hot-air engine was a plotter against the welfare of the country, rather than an enthusiastic and ingenious inventor. All honor to the noble New York merchant,* whose money, credit, and influence, were so freely extended in the aid of an enterprise so promising, yet so unfortunate. America in losing a discovery gained a bright additional name upon her catalogue of the promoters and patrons of science and art.

Numerous other examples might be adduced, illustrative of the hostility which occasionally manifests itself in the United States against the introduction of mechanical and other improvements—as the combination against the employment of the sewing-machine, the opposition to the street-sweeping machine, and the steam fire-engine, or the destruction of the telegraph, through a supposed malignant meteorological influence of electricity and the wires. Happily, however, these examples are but exceptions, and with the great majority of our countrymen the complete union of applied science with skilled labor is regarded as the tri-

* John B. Kitching.

umph of the productive forces of modern society. "Wherever," says the report above quoted, "education and an unrestricted press are allowed full scope to exercise their united influence, progress and improvement are the certain results, and among the many benefits which arise from their joint co-operation may be ranked most prominently the value which they teach men to place upon intelligent contrivance; the readiness with which they cause new improvements to be received; and the impulse which they thus unavoidably give to that inventive spirit which is gradually emancipating man from the rude forms of labor, and making what were regarded as the luxuries of one age to be looked upon in the next as the ordinary and necessary conditions of human existence."

We have spoken of applied science as the power which in future is absolutely to direct and control labor, having already become the instrument of capital. But what is science? To many this word expresses merely an idea of dry formulæ, technical descriptions, or abstruse experimentation. The subject itself is confounded with its occasional accessories. Science, however, is but the systematic arrangement and explanation of those truths and principles, so far as they have been discovered, which the Creator has established as the basis of every department of human knowledge. The application of science to labor is the direction of labor in conformity with an acquired knowledge of these truths and principles, and as every physical force, used for effecting change in the resources of the material world, must act efficiently and advantageously in exact proportion as it is directed intelligently, we recognize the force of the celebrated aphorism of Lord Bacon, "Knowledge is power."*

* This remark, so often quoted and so abundantly illustrated, may well claim a higher antiquity than the time of Lord Verulam. "Wisdom,"

That industrial effort may be guided most surely and advantageously in accomplishing its object, namely, that of production, the attainment of a certain amount of skill and knowledge is requisite; but before any production can take place, the existence of capital is essential. In short, without capital there can be no production, consequently no profitable labor, since we can not impart value to that which does not exist. Before the savage can exercise his knowledge in scooping out a canoe from the trunk of a tree, it is requisite for him not only to have acquired the trunk, but also the instrument for effecting his purpose. All capital, therefore, in the first instance, must necessarily have been derived from appropriation. In the case of the first man, the earth with its undeveloped resources was his capital, his physical and intellectual faculties the means by which his capital could be made available and production effected. The difference between the present state of man and his original condition is simply this: that the properties and relations of natural objects and forces have been discovered and applied, while the intellectual powers of man himself have been cultivated to such an extent as to enable him to apply them to the direction of labor most efficiently and successfully. It is, therefore, obvious that all the wealth now existing owes its origin to the direct application of physical and intellectual

says Solomon, "is strength." "A wise man is strong." "If the iron be blunt and he do not whet the edge, then must he put to more strength; but wisdom is profitable to direct." "Perhaps it is owing," says Hamilton, "to the imperfect sympathies which exist between theologians and philosophers, that such Scriptural sayings, and many others fraught with great principles, have received so little justice. And hence it has come to pass that many a maxim has got a fresh circulation, and has made a little fortune of renown for its author, which is after all a medal fresh minted from Bible money; the gold of Moses or Solomon, used up again with the image and superscription of Bacon, or Pascal, or Benjamin Franklin."

effort—that is, industry—to natural resources and objects constituting capital. Hence capital and industry are all that is necessary for the creation of wealth.

We have already defined wealth as consisting of those articles of utility which are essential to the subsistence and comfort of the human race. Money is especially the representative of wealth, since by the aid of money all articles capable of being transferred and exchanged from one to another may be most readily procured. “Translated into its equivalent, money means food and clothing, and a salubrious dwelling. It means instructive books and rational recreation. It means freedom from anxiety and leisure and capability for personal improvement and enjoyment. It means the education of one’s children and the power of doing good to others.” Money, however, in itself, is not wealth; but only so far as it is a medium for facilitating exchanges. When it ceases to effect this object, money becomes valueless.

The industry of no one man, however, is capable of directly satisfying all his wants and desires. Experience teaches us that by confining our labor to the production of one object, and afterward exchanging the result of such labor for the equivalent value of other employments, we can not only produce more, but more readily and effectually satisfy our desires, than if we endeavored by a varied employment to produce directly every thing necessary for our comfort or happiness. Hence the necessity of a system of exchanges. Experience also teaches men, even in the rudest forms of society, that the productive effects of labor are greatly augmented by a union of separate forces and a classification of employments. Thus ten men will construct a hut more perfectly and more economically in one day, than one man can possibly effect the same object in ten days. The beneficial results of combined effort and skill are espe-

cially seen where the process admits of division, and each laborer performs that part for which his knowledge and skill renders him best adapted. Hence the necessity of classification and division of labor.

Furthermore, as justice requires that the gain of all industrial effort should be distributed to each participant in proportion to his ability to labor effectually, we have another important element of political economy, namely, that of distribution. The consideration of the consumption of value, as connected with subsistence and production, furnishes an additional topic in the discussion of the principles involved in the economy of labor.

From what has been stated, therefore, it appears that man, in order to exist must produce, and that all production is the offspring of labor and capital. That labor and capital may be most advantageously employed, there must be knowledge, and a classification and division of labor. That productive labor may most readily and equitably satisfy the wants and desires of man, there must be exchanges, and a distribution of values. Upon the existence of these principles, and a proper administration of the laws which govern them, the prosperity and security of every society depends. That community only can attain the highest prosperity, in which industry is free, capital secure, division and classification of labor intelligent, exchange untrammelled, and distribution of wealth equitable.

The maxim of the Preacher—"The profit of the earth is for all"—contains the essence of all political economy.

It is proposed in the succeeding chapters to explain somewhat in detail, and illustrate by familiar examples, the relation which the several principles we have touched upon sustain to each other, and to man, both in his individual and social capacities.

CHAPTER II.

FEEBLE RESOURCES OF CIVILIZED MAN IN A DESERT.—ROSS COX, PETER THE WILD BOY, AND THE SAVAGE OF AVEYRON.—A MOSQUITO INDIAN ON JUAN FERNANDEZ.—CONDITIONS NECESSARY FOR THE PRODUCTION OF UTILITY.

LET us suppose a man brought up in civilized life cast upon a desert land—without food, without clothes, without fire, without tools. We see the human being in the very lowest state of helplessness. Most of the knowledge he had acquired would be worse than useless; for it would not be applicable in any way to his new position. Let the land upon which he is thrown produce spontaneous fruits—let it be free from ferocious animals—let the climate be most genial—still the man would be exceedingly powerless and wretched. The first condition of his lot, to enable him to maintain existence at all, would be that he should labor. He must labor to gather the berries from the trees—he must labor to obtain water from the rivulets—he must labor to form a garment of leaves, or of some equally accessible material, to shield his body from the sun—he must labor to render some cave or hollow tree a secure place of shelter from the dews of night. There would be no intermission of the labor necessary to provide a supply of food from hand to mouth, even in the season when wild fruits were abundant. If this labor, in the most favorable season, were interrupted for a single day, or at most for two or three days, by sickness, he would in all probability perish.

But, when the autumn was past, and the wild fruits were gone, he must prolong existence as some savage tribes are reported to do—by raw fish and undressed roots. The labor of procuring these would be infinitely greater than that of climbing trees for fruit. To catch fish without nets, and scratch up roots with naked hands, is indeed painful toil. The hopelessness of this man's condition would principally be the effect of one circumstance; he would possess no accumulation of former labor by which his present labor might be profitably directed. *The power of labor would in his case be in its least productive state.* He would partly justify the assertion that man has the feeblest natural means of any animal; because he would be utterly unpossessed of those means by which the reason of man has accumulated around every individual in the social state.

We asked the reader to *suppose* a civilized man in the very lowest state in which the power of labor may be exercised, because there is no record of any civilized man being for any length of time in such a state.

Ross Cox, a Hudson's Bay trader, whose adventures were given to the world some twenty years ago, was in this state for a fortnight; and his sufferings may furnish some idea of the greater miseries of a continuance in such a powerless condition. Having fallen asleep in the woods of the northwest of America, which he had been traversing with a large party, he missed the traces of his companions. The weather being very hot, he had left nearly all his clothes with his horse when he rambled from his friends. He had nothing to defend himself against the wolves and serpents, but a stick; he had nothing of which to make his bed but long grass and rushes; he had nothing to eat but roots and wild fruits. The man would doubtless have perished, unless he had met with some Indians, who knew better how to avail themselves of the spontaneous productions around them.

But this is not an instance of the continuance of labor in the lowest state of its power.

The few individuals, also, who have been found exposed in forests, such as Peter the Wild Boy, and the Savage of Aveyron—who were discovered, the one about a century ago, in Germany, the other about forty years since, in France—differed from the civilized man cast naked upon a desert shore in this particular—their *wants* were of the lowest nature. They were not raised above the desires of the most brutish animals. They applied those desires after the fashion of brutes. Peter was enticed from the woods by the sight of two apples, which the man who found him displayed. He did not like bread, but he eagerly peeled green sticks, and chewed the rind. He had, doubtless, subsisted in this way in the woods. He would not, at first, wear shoes, and delighted to throw the hat which was given him into the river. He was brought to England, and lived many years with a farmer in the country. During the Scotch Rebellion, in 1745, he wandered into an adjacent district; and having been apprehended as a suspicious character, was sent to prison. The jail was on fire; and Peter was found in a corner, enjoying the warmth of the flames without any fear. The Savage of Aveyron, in the same manner, had the lowest desires and the feeblest powers. He could use his hands, for instance, for no other purpose than to seize upon an object; and his sense of touch was so defective that he could not distinguish a raised surface, such as a carving, from a painting. This circumstance of the low physical and intellectual powers of these unfortunate persons prevents us exhibiting them as examples of the state which we asked the reader to suppose.

Let us advance another step in our view of the power of labor. Let us take a man in one respect in the same condition that we supposed—left upon a desert land, without any

direct social aid; but with some help to his labor by a small accumulation of former industry. We have instances on record of this next state.

In the year 1681 a Mosquito Indian was left by accident on the island of Juan Fernandez, in the Pacific Ocean; the English ship in which he was a sailor having been chased off the coast by some hostile Spanish vessels. Captain Dampier describes this man's condition in the following words:

"This Indian lived here alone above three years; and although he was several times sought after by the Spaniards, who knew he was left on the island, yet they could never find him. He was in the woods hunting for goats, when Captain Watlin drew off his men, and the ship was under sail before he came back to shore. He had with him his gun, and a knife, with a small horn of powder, and a few shot; which being spent, he contrived a way, by notching his knife, to saw the barrel of his gun into small pieces, wherewith he made harpoons, lances, hooks, and a long knife; heating the pieces first in the fire, which he struck with his gun-flint, and a piece of the barrel of his gun, which he hardened, having learned to do that among the English. The hot pieces of iron he would hammer out and bend as he pleased with stones, and saw them with his jagged knife, or grind them to an edge by long labor, and harden them to a good temper as there was occasion. With such instruments as he made in that manner, he got such provisions as the island afforded, either goats or fish. He told us that at first he was forced to eat seal, which is very ordinary meat, before he had made hooks; but afterward he never killed any seals but to make lines, cutting their skins into thongs. He had a little house, or hut, half a mile from the sea, which was lined with goat's skin; his couch, or platform of sticks, lying along about two feet distance from the ground, was

spread with the same, and was all his bedding. He had no clothes left, having worn out those he brought from Watlin's ship, but only a skin about his waist. He saw our ship the day before we came to an anchor, and did believe we were English; and therefore killed three goats in the morning, before he came to an anchor, and dressed them with cabbage, to treat us when we came ashore."

Here, indeed, is a material alteration in the wealth of a man left on an uninhabited island. He had a regular supply of goats and fish; he had the means of cooking this food; he had a house lined with goats' skins, and bedding of the same; his body was clothed with skins; he had provisions in abundance to offer, properly cooked, when his old companions came to him after three years' absence. What gave him this power to labor profitably?—to maintain existence in tolerable comfort? Simply, the gun, the knife, and the flint, which he accidentally had with him when the ship sailed away. The flint and the bit of steel which he hardened out of the gun-barrel gave him the means of procuring fire; the gun became the material for making harpoons, lances, and hooks, with which he could obtain fish and flesh. Till he had these tools, he was compelled to eat seal's flesh. The instant he possessed the tools he could make a selection of what was most agreeable to his taste. It is almost impossible to imagine a human being with less accumulation about him. His small stock of powder and shot was soon spent, and he had only an iron gun-barrel and a knife left, with the means of changing the form of the gun-barrel by fire. Yet this single accumulation enabled him to direct his labor, as all labor is directed, even in its highest employment, to the change of form and change of place of the natural supplies by which he was surrounded. He created nothing; he only gave his natural supplies a value by his labor. Until he labored, the things about him had no

to

value, as far as he was concerned; when he did obtain them by labor, they instantly acquired a value. He brought the wild goat from the mountain to his hut in the valley—he changed its place; he converted its flesh into cooked food, and its skin into a lining for his bed—he changed its form. Change of form and change of place are the beginning and end of all human labor; and the Mosquito Indian only employed the same principle for the supply of his wants which directs the labor of all the producers of civilized life into the channels of manufactures or commerce.

But the Mosquito Indian, far removed as his situation was above the condition of the man without any accumulation of former labor—that is, of the man without any capital about him—was only *in the second stage in which the power of labor can be exercised*, and in which it is comparatively still weak and powerless. He labored—he labored with accumulation—but he labored without that other power which gives the last and highest direction to profitable labor.

Let us state all the conditions necessary for the production of Utility, or of what is essential to the support, comfort, and pleasure of human life:

1. *That there shall be labor.*

The man thrown upon a desert island without accumulation—the half-idiot boy who wandered into the German forests at so early an age that he forgot all the usages of mankind—were each compelled to labor, and to labor unceasingly, to maintain existence. Even with an unbounded command of the spontaneous productions of nature, this condition is absolute. It applies to the inferior animals as well as to man. The bee wanders from flower to flower, but it is to labor for the honey. The sloth hangs upon the branches of a tree, but he labors till he has devoured all the leaves, and then climbs another tree. The condition of the support of animation is labor; and

if the labor of all animals were miraculously suspended for a season, very short as compared with the duration of individual life, the reign of animated nature upon this globe would be at an end.*

The second condition in the production of utility is—

2. *That there shall be accumulation of former labor, or capital.*

Without accumulation, as we have seen, the condition of man is the lowest in the scale of animal existence. The reason is obvious. Man requires some accumulation to aid his natural powers of laboring; for he is not provided with instruments of labor to any thing like the perfection in which they exist among the inferior animals. He wants the gnawing teeth, the tearing claws, the sharp bills, the solid mandibles that enable quadrupeds, and birds, and insects, to secure their food, and to provide shelter in so many ingenious ways, each leading us to admire and reverence the directing Providence which presides over such manifold contrivances. He must, therefore, to work profitably, accumulate instruments of work. But he must do more, even in the unsocial state, where he is at perfect liberty to direct his industry as he pleases, uncontrolled by the rights of other men. He must accumulate stores of covering and of shelter. He must have a hut and a bed of skins, which are all accumulations, or capital. He must, further, have a stock of food, which stock, being the most essential for human wants, is called *provisions*, or things provided. He would require this provision against the accidents which

* Many curious instances have been noticed by naturalists illustrative of the instinct which directs various animals to proportion the amount and nature of their labor to the exigences of particular cases. Bees transported from Europe to Bermuda omitted, after the experience of one season, to make the annual provision for the winter; and laying aside their habits of industry with the necessity of exertion, became idlers and sources of vexation to the inhabitants.

may occur to his own health, and the obstacles of weather, which may prevent him from fishing or hunting. The lowest savages have some stores. Many of the inferior animals display an equal care to provide for the exigences of the future. But still, all such labor is extremely limited. When a man is occupied only in providing immediately for his own wants—doing every thing for himself, consuming nothing but what he produces himself—his labor must have a very narrow range. The supply of the lowest necessities



SAVAGES KINDLING A FIRE.

of our nature can only be attended to, and these must be very ill supplied. The Mosquito Indian had fish, and goats' flesh, and a rude hut, and a girdle of skins; and his power of obtaining this wealth was insured to him by the absence of other individuals who would have been his competitors for what the island spontaneously produced. Had other Indians landed in numbers on the island, and had each set about procuring every thing for himself, as the active Mosquito did, they would have soon approached the point of

starvation; and then each would have begun to plunder from the other, unless they had found out the principle that would have given them all plenty. There was wanted, then, another power to give the labor of the Indian a profitable direction, besides that of accumulation. It is a power which can only exist where man is social, as it is his nature to be;—and where the principles of civilization are in a certain degree developed. It is, indeed, the beginning and the end of all civilization. It is itself civilization, partial or complete. It is the last and the most important condition in the production of useful commodities.

“Wherever men do not accumulate property, either because they actually can not do so, or will not do so, because they are yet too brutish, we find a very thin population. All the sustenance offered by a luxuriant forest well stocked with game, or by rivers and sea, suffices to support but a very scanty population. The Tchuektshi on the Northern coast of Asia, the New-Zealanders, our Indians in the West, and the inhabitants of Burmah, are striking instances of the truth of this remark. Without accumulation all men must spend their whole time in the search of food, like the animals, and the pursuit of the most necessary articles for protection; and no values can be spared for all those pursuits, which, in the end, increase comforts and happiness, indeed even food and raiment, yet not necessarily immediately so; such, for instance, as astronomy and mineralogy.”

3. *That there shall be exchanges.*

There can be no exchanges without accumulation—there can be no accumulation without labor. Exchange is that step beyond the constant labor and the partial accumulation of the lower animals, which makes man the lord of the world.

Mere existence is not the object or the destiny of man.

It is his prerogative alone of all animals to progress. But civilization is the first step of progress, and civilization can not exist without an increase and union of population. The first expedient resorted to in the attempts to civilize the North American Indian, is to withdraw him from his isolated individuality as a wanderer, and make him a member of society, organized into a town or village. Increased population can not, however, take place without increased production, and this in its turn depends wholly upon increased accumulation and exchange of products.

CHAPTER III.

SOCIETY A SYSTEM OF EXCHANGES.—SECURITY OF INDIVIDUAL PROPERTY THE PRINCIPLE OF EXCHANGE.—ALEXANDER SELKIRK AND ROBINSON CRUSOE.—IMPERFECT APPROPRIATION AND UNPROFITABLE LABOR.

SOCIETY, both in its rudest form and in its most refined and complicated relations, is nothing but a system of Exchanges. An exchange is a transaction in which both the parties who make the exchange are benefited;—and, consequently, society is a state presenting an uninterrupted succession of advantages for all its members. Every time that we make a free exchange we have a greater desire for the thing which we receive than for the thing which we give;—and the person with whom we make the exchange has a greater desire for that which we offer him than for that which he offers us. When one gives his labor for wages, it is because he has a higher estimation of the wages than of the profitless ease and freedom of remaining unemployed;—and, on the contrary, the employer who purchases his labor feels that he shall be more benefited by the results of that labor than by retaining the capital which he exchanges for it. In a simple state of society, when one man exchanges a measure of wheat for the measure of wine which another man possesses, it is evident that the one has got a greater store of wheat than he desires to consume himself, and that the other, in the same way, has got a greater store of wine;—the one exchanges something to eat for something to drink, and the other something to

drink for something to eat. In a refined state of society, when money represents the value of the exchanges, the exchange between the abundance beyond the wants of the possessor of one commodity and of another is just as real as the barter of wheat for wine. The only difference is, that the exchange is not so direct, although it is incomparably more rapid. But, however the system of exchange be carried on—whether the value of the things exchanged be determined by barter or by a price in money—all the exchangers are benefited, because all obtain what they want, through the store which they possess of what they do not want.

It has been well said that "Man might be defined to be an animal that makes exchanges."* There are other animals, indeed, such as bees and ants among insects, and beavers among quadrupeds, which to a certain extent are social; that is, they concur together in the execution of a common work for a common good: but as to their individual possessions, each labors to obtain what it desires from sources accessible to all, or plunders the stores of others. Not one insect or quadruped, however wonderful may be its approaches to rationality, has the least idea of making a formal exchange with another. The modes by which the inferior animals communicate their thoughts are probably not sufficiently determinate to allow of any such agreement. The very foundation of that agreement is a complicated principle, which man alone can understand. It is the Security of individual Property.

By property we understand that which we own, and the ownership of a thing presupposes an absolute and exclusive right over it, to use, or abuse it, to maintain it entirely for our own benefit, or to exchange it, or donate it to others. When the security of property is affected, exchanges are disturbed, and labor ceases to be remunerative, for all ex-

* Dr. Whately's Lectures on Political Economy.

which remains to him. No such agreement among mankind could ever have possibly taken place; for man is by his nature, and without any agreement, a social being. He is a being whose rights are balanced by the uncontrollable force of their relation to the rights of others. The succor which the infant man requires from its parents, to an extent, and for a duration, so much exceeding that required for the nurture of other creatures, is the natural beginning of the social state, established insensibly and by degrees. The liberty which the social man is thus compelled by the force of circumstances to renounce amounts only to a restraint upon his brute power of doing injury to his fellow-men: and for this sacrifice, in itself the cause of the highest individual and therefore general good, he obtains that dominion over every other being, and that control over the productive forces of nature, which alone can render him the monarch of all he surveys. The poor sailor, who for four years was cut off from human aid, and left alone to struggle for the means of supporting existence, was an exception, and a very rare one, to the condition of our species all over the world. His absolute rights placed him in the condition of uncontrolled feebleness; if he had become social, he would have put on the regulated strength of rights balanced by duties.

Alexander Selkirk was originally left upon the uninhabited island of Juan Fernandez at his own urgent desire. He was unhappy on board his ship, in consequence of disputes with his captain; and he resolved to rush into a state which might probably have separated him forever from the rest of mankind. In the belief that he should be so separated, he devoted all his labor and all his ingenuity to the satisfaction of his own wants alone. By continual exercise, he was enabled to run down the wild goat upon the mountains; and by persevering search, he knew where to find

the native roots that would render his goat's flesh palatable. He never thought, however, of providing any store beyond the supply of his own personal necessities. He had no motive for that thought; because there was no human being within his reach with whom he might exchange that store for other stores. The very instant, however, that the English ships, which finally gave him back to society, touched upon his shores—before he communicated by speech with any of his fellow-men, or was discovered by them—he became social. He saw that he must be an exchanger. Before the boat's crew landed he had killed several goats, and prepared a meal for his expected guests. He knew that he possessed a commodity which they did not possess. He had fresh meat, while they had only salt provisions. Of course what he had to offer was acceptable to the sailors; and he received in exchange protection, and a place among them. He renounced his sovereignty, and became once more a subject. It was better for him, he thought, to be surrounded with the regulated power of civilization, than to wield at his own will the uncertain strength of solitary uncivilization. But, had he chosen to remain upon his island, as in after-years he regretted he had not done, although a solitary man he would not have been altogether cut off from the hopes and the duties of the social state. If he had chosen to remain after that visit from his fellow-men, he would have said to them, before they had left him once more alone, "I have hunted for you my goats, I have dug for you my roots, I have shown you the fountains which issue out of my rocks; these are the resources of my dominion: give me in exchange for them a fresh supply of gunpowder and shot, some of your clothes, some of the means of repairing these clothes, some of your tools and implements of cookery, and more of your books to divert my solitary hours." Having enjoyed the benefits which he had

bestowed, they would, as just men, have paid the debt which they had incurred, and the exchange would have been completed. Immediately that they had quitted his shores, Selkirk would have looked at his resources with a new eye. His hut was rudely fashioned and wretchedly furnished. He had fashioned and furnished it as well as he could by his own labor, working upon his own materials. The visit which he had received from his fellow-men, after he had abandoned every hope of again looking upon their faces, would have led him to think that other ships would come, with whose crews he might make other exchanges—new clothes, new tools, new materials, received as the price of his own accumulations. To make the best of his circumstances when that day should arrive, he must redouble his efforts to increase his stock of commodities—some for himself, and some to exchange for other commodities, if the opportunity for exchange should ever come. He must,



DANIEL DEFOE.

therefore, transplant his vegetables, so as to be within instant reach when they should be wanted. He must render his goats domestic, instead of chasing them upon the hills. He must go forward from the hunting state, into the pastoral and agricultural.

In Defoe's story, Robinson Crusoe is represented as going into this pastoral and agricultural state. But he had more resources than Selkirk;

and he at last obtained one resource which carried him back, however incompletely, into the social condition. He acquired a fellow-laborer. He made a boat by his unassisted labor; but he could not launch it. When Friday came, and was henceforth his faithful friend and willing servant, he could launch his boat. Crusoe ultimately left his island; for the boat had given him a greater command over his circumstances. But had he continued there in companionship with Friday, there must have been such a compact as would have prevented either struggling for the property which had been created. The course of improvement that we have imagined for Selkirk supposes that he should continue in his state of exclusive proprietor—that there should be none to dispute his right. If other ships had come to his shores—if they had trafficked with him from time to time—exchanged clothes and household conveniences, and implements of cultivation, for his goats' flesh and roots—it is probable that other sailors would in time have desired to partake his plenty; that a colony would have been founded; that the island would have become populous. It is perfectly clear that, whether for exchange among themselves, or for exchange with others, the members of this colony could not have stirred a step in the cultivation of the land without appropriating its produce; and they could not have appropriated its produce without appropriating the land itself. Cultivation of the land for a common stock would have conduced to the establishment of precisely the same principle: they would still have been exchangers among themselves, and the partnership would not have lasted a day, unless each man's share of what the partnership produced had been rendered perfectly secure to him. Without security they could not have accumulated; without accumulations they could not have exchanged; without exchanges they could not have

carried forward their labors with any compensating productiveness.

Imperfect appropriation—that is, an appropriation which respects personal wealth, such as the tools and conveniences



ROBINSON CRUSOE.—(FROM A DESIGN BY STOTHARD.)

of an individual, and even secures to him the fruits of the earth when he has gathered them, but which has not reached the last step of a division of land—imperfect ap-

propriation such as this, raises up the same invincible obstacles to the production of utility; because, with this original defect, there must necessarily be unprofitable labor, small accumulation, limited exchange. Let us exemplify this by another individual case.

We have seen, in the instances of the Mosquito Indian and of Selkirk, how little a solitary man can do for himself, although he may have the most unbounded command of natural supplies—although not an atom of those natural supplies, whether produced by the earth or the water, is appropriated by others—when, in fact, he is monarch of all he surveys. Let us trace the course of another man, advanced in the ability to subdue all things to his use by association with his fellow-men; but carrying on that association in the rude and unproductive relations of savage life; not desiring to “replenish the earth” by cultivation, but seeking only to appropriate the means of existence which it has spontaneously produced; laboring, indeed, and exchanging, but not laboring and exchanging in a way that will permit the accumulation of wealth, and therefore remaining poor and miserable. We are not about to draw any fanciful picture, but merely to select some facts from a real narrative.

CHAPTER IV.

ADVENTURES OF JOHN TANNER.—HABITS OF THE AMERICAN INDIANS.—THEIR SUFFERINGS FROM FAMINE, AND FROM THE ABSENCE AMONG THEM OF THE PRINCIPLE OF DIVISION OF LABOR.—EVILS OF IRREGULAR LABOR.—RESPECT TO PROPERTY.—THEIR PRESENT IMPROVED CONDITION.—HUDSON'S BAY INDIANS.

IN the year 1828 there came to New York a white man named John Tanner, who had been thirty years a captive among the Indians in the then North-west Territory. He was carried off by a band of these people when he was a little boy, from a settlement on the Ohio river, which was occupied by his father, who was a clergyman. The boy was brought up in all the rude habits of the Indians, and became inured to the abiding miseries and uncertain pleasures of their wandering life. He grew in time to be a most skillful huntsman, and carried on large dealings with the agents of the Hudson's Bay Company, in the skins of beavers and other animals which he and his associates had shot or entrapped. The history of this man was altogether so curious, that he was induced to furnish the materials for a complete narrative of his adventures; and, accordingly, a book, fully descriptive of them, was prepared for the press by Dr. Edwin James, and printed at New York, in 1830. It is of course not within the intent of our little work to furnish any regular abridgment of John Tanner's story; but it is our wish to direct attention to some few particulars, which appear to us strikingly to illustrate some of the positions which we desire to enforce, by thus exhibiting their practical operation.

The country in which this man lived so many years was the immense territory belonging to the United States, which at that period was covered by boundless forests which the progress of civilization had not then cleared



HUDSON'S BAY COMPANY TRADERS.

away. In this region a number of scattered Indian tribes maintained a precarious existence by hunting the moose-deer and the buffalo for their supply of food, and by entrapping the foxes and martens of the woods and the beavers of the lakes, whose skins they generally exchanged with the white traders for articles of urgent necessity, such as ammunition and guns, traps, axes, and woolen blankets; but too often for ardent spirits, equally the curse of savage and of civilized life. The contact of savage man with the outskirts of civilization perhaps afflicts him with the vices of both states. But the principle of exchange, imperfectly and irregularly as it operated among the Indians, furnished some excitement to their ingenuity and their industry. Habits of providence were thus to a certain degree created; it became necessary to accumulate some capital of the commodities which could be rendered valuable by their own

labor, to exchange for commodities which their own labor, without exchange, was utterly unable to procure. The principle of exchange, too, being recognized among them in their dealings with foreigners, the security of property—without which, as we have shown, that principle can not exist at all—was one of the great rules of life among themselves. But still these poor Indians, from the mode which they proposed to themselves for the attainment of property, which consisted only in securing what nature had produced, without directing the course of her productions, were very far removed from the regular attainment of those blessings which civilized society alone offers. We shall exemplify these statements by a few details.

The extent of country over which these Indians roamed, was not less than five hundred thousand square miles—an area of the earth's surface equal to that of England, Scotland, Ireland, France, Belgium, Holland and Portugal combined. They had the unbounded command of all the natural resources of this immense territory; and yet their entire numbers did not equal the present population of a single county in one of the New England States. It may be fairly said, that each Indian required the use of at least a thousand acres for his maintenance and support. The supplies of food were so scanty—a scantiness which would at once have ceased had there been any cultivation—that if a large number of these Indians assembled together to co-operate in their hunting expeditions, they were very soon dispersed by the urgent desire of satisfying hunger. Tanner says, "We all went to hunt beavers in concert. In hunts of this kind the proceeds are sometimes equally divided; but in this instance every man retained what he had killed. In three days I collected as many skins as I could carry. But in these distant and hasty hunts little meat could be brought in; and the whole band was soon suffering with hunger.

Many of the hunters, and I among others, for want of food became extremely weak, and unable to hunt far from home." What an approach is this to the case of the lower animals; and how forcibly it reminds us of the passage in Job (c. iv., v. 11), "The fierce lion perisheth for lack of prey."* In another place he says, "I began to be dissatisfied at remaining with large bands of Indians, as it was usual for them, after having remained a short time in a place, to suffer from hunger." These sufferings were not, in many cases, of short duration, or of trifling intensity. Tanner describes one instance of famine in the following words:—"The Indians gathered around, one after another, until we became a considerable band, and then we began to suffer from hunger. The weather was very severe, and our suffering increased. A young woman was the first to die of hunger. Soon after this, a young man, her brother, was taken with that kind of delirium or madness which precedes death in such as die of starvation. In this condition he had left the lodge of his debilitated and desponding parents; and when, at a late hour in the evening, I returned from my hunt, they could not tell what had become of him. I left the camp about the middle of the night, and, following his track, I found him at some distance, lying dead in the snow."

This worst species of suffering equally existed at particular periods, whether food was sought for by large or by small parties, by bands or by individuals. Tanner was traveling with the family of the woman who had adopted him. He says, "We had now a short season of plenty; but soon became hungry again. It often happened that for two or three days we had nothing to eat; then a rabbit or two, or a bird, would afford us a prospect of protracting the sufferings of hunger a few days longer." Again he says, "Having subsisted for some time almost entirely on the

* The authorized version has *old*; the more correct translation is *fierce*.

inner bark of trees, and particularly of a climbing vine found there, our strength was much reduced."

The misery which is thus so strikingly described proceeded from the circumstance that the labor of the Indians did not take a profitable direction; and that this waste of labor (for unprofitable occupations of labor are the greatest of all wastes) arose from the one fact, that in certain particulars these Indians labored without appropriation. They depended upon the chance productions of nature, without compelling her to produce; and they did not compel her to produce, because there was no appropriation of the soil, the most efficient natural instrument of production. If the Indians had directed the productive powers of the earth to the growth of corn, instead of to the growth of foxes' skins, they would have become rich. But they could not have reached this point without appropriation of the soil. They had learned the necessity of appropriating the products of the soil, when they had bestowed labor upon obtaining them; but the last step toward productiveness was not taken. The Indians, therefore, were poor; the white settlers who have taken this last step are rich.

The imperfect appropriation which existed among the Indians, preventing, as it did, the accumulation of capital, prevented the application of that skill and knowledge which is preserved and accumulated by the division of employment. Tanner describes a poor fellow who was wounded in the arm by the accidental discharge of a gun. As there was little surgical skill among the community, because no one could devote himself to the business of surgery, the Indian, as the only chance of saving his life, resolved to cut off his own arm; "and taking two knives, the edge of one of which he had hacked into a sort of saw, he with his right hand and arm cut off his left, and threw it from him as far as he could." The labor which an individual must go

through when the state of society is so rude that there is scarcely any division of employment, and consequently scarcely any exchanges, is exhibited in many passages of Tanner's narrative. We select one. "I had no pukkavi, or mats for a lodge, and therefore had to build one of poles and long grass. I dressed more skins, made my own moccasins and leggins, and those for my children; cut wood and cooked for myself and family, made my snow-shoes, etc. All the attention and labor I had to bestow about home sometimes kept me from hunting, and I was occasionally distressed for want of provisions. I busied myself about my lodge in the night-time. When it was sufficiently light I would bring wood, and attend to other things without; at other times I was repairing my snow-shoes, or my own or my children's clothes. For nearly all the winter I slept but a very small part of the night."

Tanner was thus obliged to do every thing for himself, and consequently to work at very great disadvantage, because the principle of exchange was so imperfectly acted upon by the people among whom he lived. This principle of exchange was imperfectly acted upon, because the principle of appropriation was imperfectly acted upon. The occupation of all, and of each, was to hunt game, to prepare skins, to sell them to the traders, to make sugar from the juice of maple-trees, to build huts, and to sew the skins which they dressed and the blankets which they brought into rude coverings for their bodies. Every one of them did all of these things for himself, and of course he did them very imperfectly. The people were not divided into hunters, and furriers, and dealers, and sugar-makers, and builders, and tailors. Every man was his own hunter, furrier, dealer, sugar-maker, builder, and tailor; and consequently, every man, like Tanner, was so occupied by many things, that want of food and want of rest were ordinary

sufferings. He describes a man who was so borne down and oppressed by those manifold wants, that, in utter despair of being able to surmount them, he would lie still till he was at the point of starvation, replying to those who tried to rouse him to kill game, that he was too poor and sick to set about it. By describing himself as poor, he meant to say that he was destitute of all the necessities and comforts whose possession would encourage him to add to the store. He had little capital. The skill which he possessed of hunting game gave him a certain command over the spontaneous productions of the forest; but, as his power of hunting depended upon chance supplies of game, his labor necessarily took so irregular a direction, and was therefore so unproductive, that he never accumulated sufficient for his support in times of sickness, or for his comfortable support at any time. He became, therefore, despairing; and had that perfect apathy, that indifference to the future, which is the most pitiable evidence of extreme wretchedness. This man felt his powerless situation more keenly than his companions; but with all savage tribes there is a want of steady and persevering exertion, proceeding from the same cause. Severe labor is succeeded by long fits of idleness, because their labor takes a chance direction. This is a universal case. Habits of idleness, of irregularity, of ferocity, are the characteristics of all those who maintain existence by the pursuit of the unappropriated productions of nature; while constant application, orderly arrangement of time, and civility to others, result from systematic industry. When the support of life depends upon chance supplies, the reckless spirit of a gambler is sure to take possession of the whole man; and the misery which results from these chance supplies produces either dejection or ferocity.

Mungo Park describes the wretched condition of the in-

habitants of countries in Africa where small particles of gold are found in the rivers. Their lives were spent in hunting for the gold to exchange for useful commodities, instead of raising the commodities themselves; and they were consequently poor and miserable, listless and unsteady. Their fitful industry had too much of chance mixed up with it to afford a certain and general profit. The accounts which of late years we have received from the gold-diggings of California and Australia exhibit the same suffering from the same cause. The natives of Cape de la Hogue, in Normandy, were the most wretched and ferocious people in all France, because they depended principally for support on the wrecks that were frequent on their coasts. When there were no tempests, they made an easy transition from the character of wreckers to that of robbers. A benefactor of his species taught these unhappy people to collect the marine plants, which exist abundantly upon their shores, burn them, and dispose of the ashes for the manufacture of soda. They immediately became profitable laborers and exchangers; they obtained a property in the general intelligence of civilized life; the capital of society raised them from misery to wealth, from being destroyers to being producers.

The Indians, as we thus see, were poor and wretched, because they had no appropriation beyond articles of domestic use; because they had no property in land, and consequently no cultivation. Yet even they were not insensible to the importance of the principle, for the preservation of the few advantages that belonged to their course of life. Tanner says, "I have often known a hunter leave his traps for many days in the woods, without visiting them, or feeling any anxiety about their safety." The Indians even carried the principle of appropriation almost to a division of land; for each tribe, and sometimes each individual, had

an allotted hunting-ground—imperfectly appropriated, indeed, by the first comer, and often contested with violence by other hunters, but still showing that they approached the limit which divides the savage from the civilized state, and that, if cultivation were introduced among them, there would be a division of land, as a matter of necessity. The security of individual property is the foundation of all social improvement. It is impossible to speak of the productive power of labor in the civilized state, without viewing it in connection with that great principle of society which considers all capital as appropriated.

At the commencement of the present century, all the Indian tribes who were abiding in the territory of the United States east of the Mississippi, were in the condition which has been described by Tanner. The want of resources in the country of the Indians is always so manifest, that whenever the United States government through its agent or commissioners, assemble together any considerable number of Indians for the negotiation of treaties, or other purposes, it is absolutely necessary to provide for their support and subsistence during the continuance of the council, by transporting provisions from the nearest civilized district. So improvident are these people, and so neglectful of the resources of the country they inhabit, that unless this course was adopted by the National Government, the council would be broken up, through impending starvation. The Indians formerly inhabiting the territory now occupied by the great North-western States, have now vanished from their old hunting-grounds. Where they so recently maintained a precarious existence, there are populous cities, navigable rivers, roads, railways. The clink of the hammer is heard in the forge, and the rush of the stream from the mill-dam tells of agriculture and commerce. But even the Indians themselves have become laborers. A number of

the tribes have been removed to a large tract of country, west of the Mississippi, and have been raised into the dignity of cultivators. The Cherokees, the Creeks, and the Choctaws, with many smaller tribes, now breed cattle instead of hunting martens. They have houses in the place of huts; they have schools and churches. Instead of being extirpated by famine or the sword, they have been adopted into the great family of civilized man

But this wise and humane arrangement of the United States has not wholly removed the Indians from the wide regions of North America. In the remote interior and in the Hudson's Bay territories the life which Tanner described still goes forward. The wants of civilized society—the desire to possess the earth—have transported the Indians from the banks of the Ohio to the lands watered by the Arkansas. The opposite principle has retained them on the shores of Hudson's Bay. They are wanted there as hunters, and are not encouraged as cultivators. They are kept out of the pale of civilization, and are not received within it. The rude industry of the Hudson's Bay Indians is stimulated by the luxury of Europe into an employ which would cease to exist if the people became civilized. If agriculture were introduced among them—if they were to grow corn and keep domestic animals—they would cease to be hunters of foxes and martens, because their wants would be much better supplied by other modes of labor, involving less suffering and less uncertainty. As it is, the traders who want skins do not think of giving the Indians tools to work the ground and seeds to put in it, and cows and sheep to breed other cows and sheep. They avail themselves of the uncivilized state of these poor tribes, to render them the principal agents in the manufacture of fur, to supply the luxuries of another hemisphere. But still the exchange which the hunters carry on with the European traders, imperfect

as it is in all cases, and unjust as it is in many, is better for the Indians than no exchange; although we fear that ardent spirits take away from the Indians the greater number of the advantages which would otherwise remain with them as exchangers. If the Indians had no skins to give to Europe, Europe would have no blankets and ammunition to give to them. They would obtain their food and clothing by the use of the bow alone. They would live entirely from hand to mouth. They would have no motive for accumulation, because there would be no exchanges; and they would consequently be even poorer and more helpless than they are now as exchangers of skins. They are suffering from the effects of small accumulations and imperfect exchange; but these are far better than no accumulation and no exchange. If the course of their industry were to be changed by perfect appropriation—if they were consequently to become cultivators and manufacturers, instead



TRADING WITH THE INDIANS.

of wanderers in the woods to hunt for wild and noxious animals—they would, in the course of years, have abundance of profitable labor, because they would have abundance of capital. This is the better lot of many of the tribes with whom the gov-

ernment of the United States has made a far nobler treaty than Penn made with his Indians. As it is, their accumulations are so small, that they can not proceed with their own uncertain labor of hunting without an ad-

vance of capital on the part of the traders; and thus, even in the rude tradings of these poor Indians, credit, that complicated instrument of commercial exchange, operates upon the direction of their labor. Of course credit would not exist at all without appropriation. Their rights of property are perfect as far as they go; but they are not carried far enough to direct their labor into channels which would insure sufficient production for the laborers. Their labor is unproductive because they have small accumulations;—their accumulations are small because they have imperfect exchange;—their exchange is imperfect because they have limited appropriation. We may illustrate this state of imperfect production by another passage from Tanner's story :

“The Hudson's Bay Company had now no post in that part of the country, and the Indians were soon made conscious of the advantage which had formerly resulted to them from the competition between rival trading companies. Mr. Wells, at the commencement of winter, called us all together, gave the Indians a ten-gallon keg of rum and some tobacco, telling them at the same time he would not credit one of them the value of a single needle. When they brought skins he would buy them, and give in exchange such articles as were necessary for their comfort and subsistence during the winter. I was not with the Indians when this talk was held. When it was reported to me, and a share of the presents offered me, I not only refused to accept any thing, but reproached the Indians for their pusillanimity in submitting to such terms. They had been accustomed for many years to receive credits in the fall; they were now entirely destitute not of clothing merely, but of ammunition, and many of them of guns and traps. How were they, without the accustomed aid from the traders, to subsist themselves and their families during the ensuing

winter? A few days afterward I went to Mr. Wells, and told him that I was poor, with a large family to support by my own exertions; and that I must unavoidably suffer, and perhaps perish, unless he would give me such a credit as I had always in the fall been accustomed to receive. He would not listen to my representation, and told me roughly to be gone from his house. I then took eight silver beavers, such as are worn by the women as ornaments on their dress, and which I had purchased the year before at just twice the price that was commonly given for a capote;* I laid them before him on the table, and asked him to give me a capote for them, or retain them as a pledge for the payment of the price of the garment, as soon as I could procure the peltries.† He took up the ornaments, threw them in my face, and told me never to come inside of his house again. The cold weather of the winter had not yet set in, and I went immediately to my hunting-ground, killed a number of moose, and set my wife to make the skins into such garments as were best adapted to the winter season, and which I now saw we should be compelled to substitute for the blankets and woolen clothes we had been accustomed to receive from the traders."

This incident at once shows us that the great blessing of the civilized state is its increase of the powers of production. Here we see the Indians, surrounded on all sides by wild animals whose skins might be made into garments, reduced to the extremity of distress because the traders refused to advance them blankets and other necessities, to be used during the months when they were employed in catching the animals from which they might obtain the skins. It is easy to see that the Indians were a long way removed from the power of making blankets themselves. Before they could reach this point, their forests must have been con-

* A sort of great-coat.

† Skins.

verted into pasture-grounds; they must have raised flocks of sheep, and learned all the various complicated arts, and possessed all the ingenious machinery, for converting wool into cloth. By their exchange of furs for blankets, they obtained a share in the productiveness of civilization; they obtained comfortable clothing with much less labor than they could have made it out of the furs. If Tanner had not considered the capote which he desired to obtain from the traders, better, and less costly, than the garment of moose-skins, he would not have carried on any exchange of the two articles with the traders. The skins of martens and foxes were only valuable to the Indians, without exchange, for the purpose of sewing together to make covering. They had a different value in Europe as articles of luxury; and therefore the Indians by exchange obtained a greater plenty of superior clothing than if they had used the skins themselves. But the very nature of the trade, depending upon chance supplies, rendered it impossible that they should accumulate. They had such pressing need of ammunition, traps, and blankets, that the produce of the labor of one hunting season was not more than sufficient to procure the commodities which they required to consume in the same season. But supposing the Indians could have bred foxes and martens and beavers, as we breed rabbits, for the supply of the European demand for fur, doubtless they would have then advanced many steps in the character of producers. The thing is perhaps impossible; but were it possible, and were the Indians to have practiced it, they would immediately have become capitalists, to an extent that would have soon rendered them independent of the credit of the traders. They must, however, have previously established a more perfect appropriation. Each must have inclosed his own hunting-ground; and each must have raised some food for the maintenance of his own

stock of beavers, foxes, and martens. It would be easier, doubtless, to raise the food for themselves, and ultimately to exchange corn for clothing, instead of furs for clothing. When this happens—and it will happen sooner or later, unless the remnant of the hunting Indians are extirpated by their poverty, which proceeds from their imperfect production—Europe must go without the brilliant variety of skins which are procured at the cost of so much labor, accompanied with so much wretchedness, because the labor is so unproductive to the laborers. When the ladies of Europe and the United States are compelled to wear capes of rabbits' fur instead of sables, and when the hair of the beaver ceases to be employed in the manufacture of our hats, the wooded regions of Hudson's Bay will have been cleared—the fur-bearing animals will have perished—corn will be growing in the forest and the marsh—the inhabitants will be building houses instead of trapping foxes;—there will be appropriation and capital, profitable labor and comfort. Three hundred thousand mink and marten-skins will no longer be sent from those shores to England in one year; but England may send to those shores woven cottons and worsteds, pottery and tools, in exchange for products whose cultivation will have exterminated the minks and martens.

CHAPTER V.

THE PRODIGAL.—ADVANTAGES OF THE POOREST MAN IN CIVILIZED LIFE OVER THE RICHEST SAVAGE.—SAVINGS-BANKS, DEPOSITS, AND INTEREST.—PROGRESS OF ACCUMULATION.—INSECURITY OF CAPITAL, ITS CAUSES AND RESULTS.—CONDITION OF TURKEY.—EXPULSION OF THE MOORS AND JEWS FROM SPAIN.—REVOCATION OF THE EDICT OF NANTES.—PROPERTY, ITS CONSTITUENTS.—ACCUMULATION OF CAPITAL.

THERE is an account in Foster's Essays of a man who, having by a short career of boundless extravagance dissipated every shilling of a large estate which he inherited from his fathers, obtained possession again of the whole property by a course which the writer well describes as a singular illustration of decision of character. The unfortunate prodigal, driven forth from the home of his early years by his own imprudence, and reduced to absolute want, wandered about for some time in a state of almost unconscious despair, meditating self-destruction, till he at last sat down upon a hill which overlooked the fertile fields that he once called his own. "He remained," says the narrative, "fixed in thought a number of hours, at the end of which he sprang from the ground with a vehement exulting emotion. He had formed his resolution, which was, that all these estates should be his again; he had formed his plan, too, which he instantly began to execute." We shall show, by and by, how this plan worked in detail; it will be sufficient, just now, to examine the principles upon which it was founded. He looked to no freak of fortune to throw into his lap by chance what he had cast from him by

willfulness. He neither trusted to inherit those lands from their present possessor by his favor, nor to wring them from him by a course of law. He was not rash and foolish enough to dream of obtaining again by force those possessions which he had exchanged for vain superfluities. But he resolved to become once more their master by the operation of the only principle which could give them to him in a civilized society. He resolved to obtain them again by the same agency through which he had lost them—by exchange. But what had he to exchange? His capital was gone, even to the uttermost farthing; he must labor to obtain new capital. With a courage worthy of imitation he resolved to accept the very first work that should be offered to him, and, however low the wages of that work, to spend only a part of those wages, leaving something for a store. The day that he made this resolution he carried it into execution. He found some service to be performed—irksome, doubtless, and in many eyes degrading. But he had a purpose which made every occupation appear honorable, as every occupation truly is that is productive of utility. Incessant labor and scrupulous parsimony soon accumulated for him a capital; and the store, gathered together with such energy, was a rapidly increasing one. In no very great number of years the once destitute laborer was again a rich proprietor. He had earned again all that he had lost. The lands of his fathers were again his. He had accomplished his plan.

A man so circumstanced—one who possesses no capital, and is only master of his own natural powers—if suddenly thrown down from a condition of ease, must look upon the world, at the first view, with a deep apprehension. He sees every thing around him appropriated. He is in the very opposite condition of Alexander Selkirk, when he is made to exclaim "I am monarch of all I survey." Instead of

feeling that his "right there is none to dispute," he knows that every blade of corn that covers the fields, every animal that grazes in the pastures, is equally numbered as the property of some individual owner, and can only pass into his possession by exchange. In the towns it is the same as in the country. The dealer in bread and in clothes—the victualer from whom he would ask a cup of beer and a night's lodging—will give him nothing, although they will exchange every thing. He can not exist, except as a beggar, unless he puts himself in the condition to become an exchanger.

But still, with all these apparent difficulties, his prospects of subsisting, and of subsisting comfortably, are far greater than in any other situation in which he must labor to live. As we have already seen, the condition of by far the greater number of the millions that constitute the exchangers of civilized society is greatly superior to that of the few thousands who exist upon the precarious supplies of the unappropriated productions of nature in the savage life. Although an exchange must always be made—although in very few cases "the fowl and the brute" offer themselves to the wayfaring man for his daily food—although no herbs worth the gathering can be found for the support of life in the few uncultivated parts of a highly cultivated country—the aggregate riches are so abundant, and the facilities which exist for exchanging capital for labor are therefore so manifold, that the poorest man in a state of civilization has a much greater certainty of supplying all his wants, and of supplying them with considerably more ease, than the richest man in a state of uncivilization. The principle upon which he has to rely is, that in a highly civilized country there is large production. There is large production because there is profitable labor; there is profitable labor because there is large accumulation; there is large accumu-

lation because there is unlimited exchange; there is unlimited exchange because there is universal appropriation. John Tanner was accounted a rich man by the Indians—doubtless because he was more industrious than the greater number of them; but we have seen what privations he often suffered. He suffered privations because there was no capital, no accumulation of the products of labor in the country in which he lived. Where such a store exists, the poorest man has a tolerable certainty that he may obtain his share of it as an exchanger; and the greater the store the greater the certainty that his labor, or the power of adding to the store, will obtain a full proportion of what previous labor has gathered together.

In 1856,* the amount of money vested to the account of depositors in seventy-three of the savings-banks of Massachusetts, was \$27,296,216—paying an annual interest of more than a million of dollars. The statistics of Great Britain inform us, that since the establishment of these institutions in that kingdom down to the year 1853, the gross amount of interest paid to depositors was upward of *one hundred and fourteen millions of dollars*. The capital which has so fructified as to produce one hundred and fourteen millions as interest, was the result of the small accumulations, penny by penny, shilling by shilling, and dollar by

* The Annual Reports of the Savings-banks of Massachusetts for 1856, show the wonderful growth of these institutions since 1834, a period of 21 years:

In 1834 the total number of depositors was.....	24,256
Amount deposited.....	\$3,407,773 90
In 1855, total number of depositors.....	148,263
Amount deposited.....	\$27,296,216 75

The increase of deposits since 1845 has been about \$17,500,000, and the increase of depositors about 100,000. About one eighth the population of Massachusetts are depositors in these banks. If the entire sum was divided among all the depositors, it would give each \$180.

dollar, of the savings of that class of persons who, in every country, have the greatest difficulty in accumulating. Habitual efforts of self-denial, and a rigid determination to postpone temporary gratification to permanent good, could alone have enabled these accumulators to retain so much of what they had produced beyond the amount of what they consumed.

The capital sum of more than twenty-seven millions now belonging to the depositors in the seventy-three savings-banks of Massachusetts, represents as many products of industry as could be bought by that sum. It is a capital which remains for the encouragement of *productive* consumption; that is, it is now applied as a fund for setting others to produce, to enable them to consume while they produce, and in like manner to accumulate some part of their productions beyond what they consume. The amount of interest which the depositors have received is the price paid for the use of the capital by others who require its employment. The whole amount of our national riches—the capital of this and of every other country—has been formed by the same slow but certain process of individual savings, and the accumulations of savings, stimulating new industry, and yielding new accumulations.

The consumption of any production is the destruction of its value. The production was created by industry to administer to individual wants, to be consumed, to be destroyed. When a thing capable of being consumed is produced, a value is created; when it is consumed, that value is destroyed. The general mass of riches then remains the same as it was before that production took place. If the power to produce, and the disposition to consume, were equal and constant, there could be no saving, no accumulation, no capital. If mankind, by their intelligence, their skill, their division of employments, their union of forces, had not put themselves in a condition to produce more than

is consumed while the great number of industrious undertakings are in progress, society would have been stationary, civilization could never have advanced.

It may assist us in making the value of capital more clear, if we take a rapid view of the most obvious features of the accumulation of a highly civilized country.

The first operation in a newly settled country is what is termed to clear it. Look at a civilized country, such as the United States. It *is* cleared. The encumbering woods are cut down, the unhealthy marshes are drained. The noxious animals which were once the principal inhabitants of the land are exterminated; and their place is supplied with useful creatures, bred, nourished, and domesticated by human art, and multiplied to an extent exactly proportioned to the wants of the population. Forests remain for the produce of timber, but they are confined within the limits of their utility; mountains "where the nibbling flocks do stray," have ceased to be barriers between nations and districts. Every vegetable that the diligence of man has been able to transplant from the most distant regions is raised for food. The fields are producing a provision for the coming year; while the stock for immediate consumption is ample, and the laws of demand and supply are so perfectly in action, and the facilities of communication with every region so unimpeded, that scarcity seldom occurs, and famine never. Rivers have been narrowed to bounds which limit their inundations, and they have been made navigable wherever their navigation could be profitable. The country is covered with roads, with canals, and now, more especially, with rail-roads, which render distant States as near to each other for commercial purposes as neighboring villages in less advanced countries. Science has created the electric telegraph, by which prices are equalized through every district, by an instant communication between producers and con-

sumers. Houses, all possessing some comforts which were unknown even to the rich a few centuries ago, cover the land, in scattered farm-houses and mansions, in villages, in towns, and in cities. These houses are filled with an almost inconceivable number of conveniences and luxuries—furniture, glass, porcelain, plate, linen, clothes, books, pictures. In the stores of the merchants and traders the resources of human ingenuity are displayed in every variety of substances and forms that can exhibit the multitude of civilized wants; and in the manufactories are seen the wonderful adaptations of science for satisfying those wants at the cheapest cost. The people who inhabit such a civilized land have not only the readiest communication with each other by the means of roads and canals, but can trade by the agency of ships with all parts of the world. To carry on their intercourse among themselves they speak one common language, reduced to certain rules, and not broken into an embarrassing variety of unintelligible dialects. Their written communications are conveyed to the obscurest corners of their own country, and even to the most remote lands, with prompt and unfailing regularity, and now with a cheapness which makes the poorest and the richest equal in their power to connect the distant with their thoughts by mutual correspondence. Whatever is transacted in such a populous hive, the knowledge of which can afford profit or amusement to the community, is recorded with a rapidity which is not more astonishing than the general accuracy of the record. What is more important, the discoveries of science, the elegances of literature, and all that can advance the general intelligence, are preserved and diffused with the utmost ease, expedition, and security, so that the public stock of knowledge is constantly increasing. Lastly, the general well-being of all is sustained by laws—sometimes indeed imperfectly devised and expensively administered—

but on the whole of infinite value to every member of the community; and the property of all is defended from external invasion and from internal anarchy by the power of government, which will be respected only in proportion as it advances the general good of the humblest of its subjects, by securing their capital from plunder and defending their industry from oppression.

✧ This capital is ready to be won by the power of every man capable of work. But he must exercise this power in complete subjection to the natural laws by which every exchange of society is regulated. These laws sometimes prevent labor being instantly exchanged with capital, for an exchange necessarily requires a balance to be preserved between what one man has to supply and what another man has to demand; but in their general effect they secure to labor the certainty that there shall be abundance of capital to exchange with; and that, if prudence and diligence go together, the laborer may himself become a capitalist, and even pass out of the condition of a laborer into that of a proprietor, or one who lives upon accumulated produce. The experience of every day, especially in the United States, where lowliness of birth or position is no barrier to success, shows this process going forward—not in a solitary instance, as in that of the ruined and restored man whose tale we have just told—but in the case of nearly all our eminent merchants, manufacturers and capitalists, whose commencement in life was of the most humble character. ↑ That noble New England merchant, Amos Lawrence, whose beneficence and charity is to be counted in hundreds of thousands of dollars, came to Boston, his clothes in a bundle and a few dollars in his pocket, to enter as a subordinate clerk in the store of a small trader. The germ of the colossal fortune acquired by John Jacob Astor, was once contained in the small pack which he bore upon his shoulders in the capacity of a trav-

eling merchant. Instances of a similar nature are familiar to every one. But if the laborer or the great body of laborers were to imagine that they could obtain such a proportion of the capital of a civilized country except as exchangers, the store would instantly vanish. They might, perhaps, divide by force the crops in barns and the clothes in warehouses; but there would be no more crops or clothes. The principle upon which all accumulation depends, that of security of property, being destroyed, the accumulation would be destroyed. Whatever tends to make the state of society insecure, tends to prevent the employment of capital. In despotic countries, that insecurity is produced by the tyranny of one. In other countries, where the people, having been misgoverned, are badly educated, that insecurity is produced by the tyranny of many. In either case, the bulk of the people themselves are the first to suffer, whether by the outrages of a tyrant or by their own outrages. They prevent labor by driving away to other channels the funds which support labor.

Of all the causes or agencies which can affect the industry and production, and consequently the civilization and well-being of any people, the most disastrous and destructive is that which arises from public oppression and unjust legislation. "It drinks up," says an eminent writer on political economy, "the spirit of a people by inflicting wrong through means of an agency which was created for the sole purpose of preventing wrong; and which was intended to be the ultimate and faithful refuge of the friendless. When the antidote for evil becomes the source of evil, what hope for man is left? When society itself sets the example of peculation, what shall prevent the individuals of society from imitating that example? Hence private injustice is always the prolific parent of private violence. The result is, that capital emigrates, production ceases, and a nation either

sinks down in hopeless dependence, or else the people, harassed beyond endurance, and believing that their condition can not be made worse by any change, rush into all the horrors of civil war." A forcible illustration of such a state of affairs as has been described, may be found in the present condition of Turkey and Egypt. The oppression and extortion of the government, the rapacity and venality of all officials, have impaired the sense of security, both as regards property and person, discouraged industry, confined the routine of agriculture within the rudest limits, and forced the great bulk of the population to live in a state of semi-barbarism. "The great proportion of the agriculturists," says Thornton, in his late work on Turkey, "cultivate the same articles of produce, and pursue the same course of culture; consequently every man possesses a superfluity of the article his neighbor is desirous of selling;" hence there are no exchanges. "In consequence of the government regulations, the whole grain crops frequently remain nearly ten months in the open air, on the thrashing-floors, merely to prevent the cultivator from extracting some portion for the use of his family, without paying the tax on this trifle." As might be expected, the value of labor and land is reduced to the lowest point. Civil commotions and private outrage are common, while population remains permanent or decreases.

A notable instance of the effect of unjust measures on the part of both government and people in paralyzing the energies and arresting the progress of a whole nation, may be found in the intolerant and fanatical persecution of the Jews and Moors of Spain, which resulted in their expulsion or voluntary emigration from that country. These two classes composed the bulk of the intelligent industrial population of Spain, the artificers, the mechanics, the merchants, the bankers, and a majority of the capitalists engaged in trade

or commerce. The result of such impolitic measures, as was foretold at the time, has been to cripple the resources of the country, convert flourishing districts into uninhabited wastes, dry up the currents of trade and to diminish capital; to no other single act of policy is Spain more indebted for her present impoverished and degraded condition, than to the treatment of her Moorish and Jewish subjects in the fifteenth and sixteenth centuries. We find another striking instance of the effect of oppression on the part of the State on the people, in diminishing national production and wealth, in the expulsion of the French Huguenots from France, by the revocation of the Edict of Nantes. This act, while it inflicted a most severe blow upon the industrial resources and power of France, augmented the capital and the skill of the neighboring nations which received the fugitives.

The adoption of any measures by the government, or people of the United States, which could in any degree tend to prevent, or divert the great tide of emigration of labor and capital from Europe to our shores, would only find a parallel in its disastrous effects, with the instances above cited.*

In some eastern countries, where, when a man becomes

* In the year 1849, the whole number of foreign emigrants arriving at the different ports of the United States was 296,000. If we estimate the value of labor, the skill, and the capital of each of these emigrants at only one hundred dollars, we have an augmentation of the national wealth in a single year, of more than twenty-nine millions. When we reflect, however, that the great majority of these emigrants are able-bodied men and women, accustomed to hard, persevering labor—many to skilled labor—that numbers also possess, in money or implements, varying amounts of capital, the estimated value of each to the country, which we have given, will appear too inconsiderable. Estimating the value at five hundred dollars, less than half the amount of an able-bodied negro-slave, we have the enormous sum of \$148,000,000, added to the wealth of the United States in a single year, from foreign emigration alone.

rich, his property is seized upon by the one tyrant, nobody dares to avow that he has any property. Capital is not employed; it is hidden: and the people who have capital live not upon its profits, but by the diminution of the capital itself. In the very earliest times we hear of concealed riches. In the book of Job those who "long for death" are said to "dig for it more than for hid treasures." The tales of the East are full of allusions to money buried and money dug up. The poor woodman, in making up his miserable faggot, discovers a trap-door, and becomes rich. In India, where the rule of Mohammedan princes was usually one of tyranny, even now the search after treasure goes on. The popular mind is filled with the old traditions; and so men dream of bags of gold to be discovered in caves and places of desolation, and they forthwith dig, till hope is banished, and the real treasure is found in systematic industry. It was the same in the feudal times in England, when the lord tyrannized over his vassals, and no property was safe but in the hands of the strongest. In those times people who had treasure buried it. Who thinks of burying treasure now in England? In the plays and story-books which depict the manners of early times, we constantly read of people finding bags of money. The people of England never find bags of money now, except when a very old hoard, hidden in some time of national trouble, comes to light. So little time ago as the reign of Charles II., we read of the Secretary to the Admiralty going down from London to his country-house, with all his money in his carriage, to bury it in his garden. What Samuel Pepys records of his doings with his own money, was a natural consequence of the practices of a previous time. He also chronicles, in several places of his curious diary, his laborious searches, day by day, for £7,000 hid in butter-firkins in the cellars of the Tower of London. Why is money not hidden and not

sought for now? Because people have security for the employment of it, and by the employment of it in creating new produce the nation's stock of capital goes on hourly increasing. When we read in Blackstone's "Commentaries on the Laws of England," that the concealment of treasure-trove, or found treasure, from the king, is a misdemeanor punishable by fine and imprisonment, and that it was formerly a capital offense, we at once see that this is a law no longer for our time; and we learn from this instance, as from many others, how the progress of civilization silently repeals laws which belong to another condition of the people.

When we look at the nature of the accumulated wealth of society, it is easy to see that the poorest member of it who dedicates himself to profitable labor is in a certain sense rich—rich, as compared with the unproductive and therefore poor individuals of any uncivilized tribe. The very scaffolding, if we may so express it, of the social structure, and the moral forces by which that structure was reared, and is upheld, are to him riches. To be rich is to possess the means of supplying our wants; to be poor is to be destitute of those means. Riches do not consist only of money and lands, of stores, of food, or clothing, of machines and tools. The particular knowledge of any art; the general understanding of the laws of nature; the habit from experience of doing any work in the readiest way; the facility of communicating ideas by written language; the enjoyment of institutions conceived in the spirit of social improvement; the use of the general conveniences of civilized life, such as roads: these advantages, which the poorest man in the United States possesses, or may possess, constitute individual property. They are means for the supply of wants, which in themselves are essentially more valuable for obtaining his full share of what is appropriated, than if all the

productive powers of nature were unappropriated, and if, consequently, these great elements of civilization did not exist. Society obtains its almost unlimited command over riches by the increase and preservation of knowledge, and by the division of employments, including union of power. In his double capacity of a consumer and a producer, the humblest man has the full benefit of these means of wealth—of these great instruments by which the productive power of labor is carried to its highest point.

But if these common advantages, these public means of society, offering so many important agents to the individual for the gratification of his wants, alone are worth more to him than all the precarious power of the savage state—how incomparably greater are his advantages when we consider the wonderful accumulations, in the form of private wealth, which are ready to be exchanged with the labor of all those who are in a condition to add to the store. It has been truly said by M. Say, a French economist, "It is a great misfortune to be poor, but it is a much greater misfortune for the poor man to be surrounded only with other poor like himself." The reason is obvious. The productive power of labor can be carried but a very little way without accumulation of capital. In a highly civilized country, capital is heaped up on every side by ages of toil and perseverance. A succession, during a long series of years, of small advantages to individuals unceasingly renewed and carried forward by the principle of exchanges, has produced this prodigious amount of the aggregate capital of a country whose civilization is of ancient date. This accumulation of the means of existence, and of all that makes existence comfortable, is principally resulting from the labors of those who have gone before us. It is a stock which was beyond their own immediate wants, and which was not extinguished

with their lives. It is our capital. It has been produced by labor alone, physical and mental. It can be kept up only by the same power which has created it, carried to the highest point of productiveness by the arrangements of society.

CHAPTER VI.

COMMON INTERESTS OF CAPITAL AND LABOR.—LABOR DIRECTED BY ACCUMULATION.
—CAPITAL ENHANCED BY LABOR.—BALANCE OF RIGHTS AND DUTIES.—RELATION
OF DEMAND AND SUPPLY.—MONEY EXCHANGES.

THERE is an old proverb, that “When two men ride on one horse, one man must ride behind.” Capital and Labor are, as we think, destined to perform a journey together to the end of time. We have shown how they proceed on this journey. We have shown that, although Labor is the parent of all wealth, its struggles for the conversion of the rude supplies of nature into objects of utility are most feeble in their effects till they are assisted by accumulation. Before the joint interests of Labor and Capital were at all understood, they kept separate; when they only began to be understood, as we shall show, they were constantly pulling different ways, instead of giving “a long pull, a strong pull, and a pull altogether;” and even now, when these interests in many respects are still imperfectly understood, they occasionally quarrel about the conditions upon which they will continue to travel in company. In the very outset of the journey, Labor, doubtless, took the lead. In the dim morning of society Labor was up and stirring before Capital was awake. Labor did not then ride; he traveled slowly on foot through very dirty ways. Capital, at length, as slowly followed after, through the same mire, but at an humble distance from his parent. But when Capital grew into strength, he saw that there were quicker and more

agreeable modes of traveling for both than Labor had found out. He procured that fleet and untiring horse Exchange; and when he proposed to Labor that they should mount together, he claimed the right, and kept it, for their mutual benefit, of taking the direction of the horse. For this reason, as it appears to us, we are called upon to assign to one of the companions, according to the practice of the old Knights Templars, the privilege of sitting before the other—holding the reins, indeed, but in all respects having a community of interests and an equality of duties, as well as rights, with his fellow-traveler.

Let us endeavor to advance another step, in the illustration of these positions, by going back to the prodigal who had spent all his substance. Let us survey him at the moment when he had made the wise, and in many respects heroic, resolution to pass from the condition of a consumer into that of a producer. The story says, "The first thing that drew his attention was a heap of coals shot out of a cart on the pavement before a house. He offered himself to shovel or wheel them into the place where they were to be laid, and was employed." Here, then, we see that the labor of this man was wholly and imperatively directed by accumulation. It was directed as absolutely by the accumulation of others as the labor of Dampier's Mosquito Indian was directed by his own accumulation. The Indian could not labor profitably—he could not obtain fish and goats for his food, instead of seal's flesh—till he had called into action the power which he possessed in his knife and his gun-barrel. The prodigal had no accumulation whatever of his own. He had not even the accumulation of peculiar skill in any mode of labor; for a continual process of waste enlarges neither the mental nor physical faculties, and generally leaves the wretched being who has to pass into the new condition of a producer as helpless as the weakest child.

He had nothing but the lowest power, of laboring without peculiar knowledge or skill. He had, however, an intensity and consistency of purpose which raised this humble power into real strength. He was determined never to go backward, always to go on. He knew, too, his duties as well as his rights; and he saw that he must wholly accommodate his power to the greater power which was in action around him. When he passed into the condition of a producer, he saw that his powers and rights were wholly limited and directed by the principles necessary to advance production; and that his own share of what he assisted in producing must be measured by the laws which enabled him to produce at all. He found himself in a position where his labor was absolutely governed by the system of exchanges. No other system could operate around him, because he was in a civilized country. Had he been thrown upon a desert land without food and shelter, his labor must have been instantly and directly applied to procuring food and shelter. He was equally without food and shelter in a civilized country. But the system of exchanges being in action, he did not apply his labor directly to the production of food and lodging for himself. He added by his labor a new value to a heap of coals; he enabled another man more readily to acquire the means of warmth; and by this service, which he exchanged for "a few pence" and "a small gratuity of meat and drink," he indirectly obtained food and lodging. He conferred an additional value upon a heap of coals, and that additional value was represented by the "few pence" and "a small gratuity of meat and drink." Had the system of exchange been less advanced, that is, had society been less civilized, he would probably have exchanged his labor for some object of utility by another and a ruder mode. He would have received a portion of the coals as the price of the labor by which he gave an additional value to the whole

heap. But mark the inconvenience of such a mode of exchange. His first want was food; his next, shelter. Had he earned the coals, he must have carried them about till he had found some other person ready to exchange food and lodging for coals. Such an occurrence might have happened, but it would have been a lucky accident. He could find all persons ready to exchange food and clothes for money, because money was ready again to exchange for other articles of utility which they might require, and which they would more readily obtain by the money than by the food and clothes which our laborer had received for them. During the course of the unprofitable labor of waiting till he had found an exchanger who wanted coals, he might have perished. What, then, gave him the means of profitable labor, and furnished him with an article which every one was ready to receive in exchange for articles of immediate necessity? Capital in two forms. The heap of coals was capital. The coals represented a very great and various accumulation of former labor that had been employed in giving them value. The coals were altogether valueless till labor had been employed to raise them from the pit, and to convey them to the door of the man who was about to consume them. But with what various helps had this labor worked! Mere manual labor could have done little or nothing with the coals in the pit. Machines had raised them from the pit. Machines had transported them from the pit to the door of the consumer. They would have remained buried in the earth but for large accumulations of knowledge, and large accumulations of pecuniary wealth to set that knowledge in action by exchanging with it. The heap of coals represented all this accumulation; and it more immediately represented the Circulating Capital of consumable articles of utility, which had been paid in the shape of wages at every stage of the labor exercised in raising the

coals from the mine, and conveying them to the spot in which the prodigal found them laid. The coals had almost attained their highest value by a succession of labor, but one labor was still wanting to give them the highest value. They were at their lowest value when they remained unbroken in the coal-pit; they were at their highest value when they were deposited in the cellar of the consumer. For that last labor there was circulating capital ready to be exchanged. The man whose course of production we have been tracing imparted to them this last value, and for this labor he received a "few pence" and a "gratuity of meat and drink." These consumable commodities, and the money which might be exchanged for other consumable commodities, were circulating capital. They supplied his most pressing wants with incomparably more readiness and certainty than if he had been turned loose among the unappropriated productions of nature with unlimited freedom and absolute rights. In the state in which he was actually placed, his rights were limited by his duties; but this balance of rights and duties was the chief instrument in the satisfaction of his wants. Let us examine the principle a little more in detail.

An exchange was to be carried on between the owner of the coals and the man who was willing to shovel them into the owner's cellar. The laborer did not want any distinct portion of the coals, but he wanted some articles of more urgent necessity in exchange for the new value which he was ready to bestow upon the coals. The object of each exchanger was, that labor should be exchanged with capital. That object could not have been accomplished, or it would have been accomplished slowly, imperfectly, and therefore unprofitably, unless there had been interchangeable freedom and security for both exchangers—for the exchanger of capital and the exchanger of labor. The first right of the laborer was, that his labor should be free; the

first right of the capitalist was, that his capital should be free. The rights of each were built upon the security of property. Could this security have been violated, it might have happened, either that the laborer should have been compelled to shovel in the coals, or that the capitalist should have been compelled to employ the laborer to shovel them in. Had the lot of the unfortunate prodigal been cast in such a state of society as would have allowed this violation of the natural rights of the laborer and the capitalist, he would have found little accumulation to give a profitable direction to his labor. He would have found production suspended or languishing. There would probably have been no heap of coals wanting his labor to give them the last value; for the engines would have been idle that raised them from the pit, and the men would have been idle that directed the engines. The circulating capital that found wages for the men and fuel for the engines, would have been idle, because it could not have worked with security. Accumulation, therefore, would have been suspended; and all profitable labor would, in consequence, have been suspended. It was the unquestionable right of the laborer that his labor should be free; but it was balanced by the right of the capitalist that his accumulation should be secure. Could the labor have seized upon the capital, or the capital upon the labor, production would have been stopped altogether, or in part. The mutual freedom and security of labor and capital compel production to go forward; and labor and capital take their respective stations, and perform their respective duties, altogether with reference to the laws which govern production. These laws are founded upon the natural act of the system of exchange, carrying forward all its operations by the natural action of the great principle of demand and supply. When capital and labor know how to accommodate themselves to the direction of these natu-

DEMAND AND SUPPLY.

"We are in a healthy state with respect to their individual rights, and the rights of industry generally. We are in that state in which each is working to the common good in carrying forward the business of production."

The story of the prodigal goes on to say, "He then looked out for the next thing that might chance to offer; and went with indefatigable industry through a succession of servile employments in different places, of longer or shorter duration." Here we see the principle of Demand and Supply set in active operation. "He looked out for the next thing that might chance to offer." He was ready with his supply of labor immediately that he saw a demand for it. Doubtless the "indefatigable industry" with which he was ready with his supply created a demand, and thus he had in some degree a control over the demand. But in most cases the demand went before the supply, and he had thus to watch and wait upon the demand. In many instances demand and supply exercise a joint influence and control, each with regard to the other. Pliny, the Roman naturalist, relates that in the year 454 after the building of Rome (300 years before Christ) a number of barbers came over from Sicily to shave the Romans, who till that time had worn long beards. But the barbers came in consequence of being sent for by a man in authority. The demand here distinctly went before the supply; but the supply, doubtless, acted greatly upon the demand. During a time of wild financial speculation in Paris, created by what is called the Mississippi bubble, a hump-backed man went daily into the street where the stock-jobbers were accustomed to assemble, and earned money by allowing them to sign their contracts upon the natural desk with which he was encumbered. The hump-back was doubtless a shrewd fellow, and saw the difficulty which the stock-jobbers labored. He supplied what

they appeared to want, and a demand was instantly created for his hump. He was well paid, says the story. That was because the supply was smaller than the demand. If other men with humps had been attracted by the demand, or if persons had come to the street with portable desks more convenient than the hump, the reward of his service would naturally have become less. He must have yielded to the inevitable law by which the amount of circulating capital, as compared with the number of laborers, prescribes the terms upon which capital and labor are united.

By following the direction which capital gave to his industry, the prodigal, whose course we have traced up to the point when he went into the condition of a laborer, became at length a capitalist. "He had gained, after a considerable time, money enough to purchase, in order to sell again, a few cattle, of which he had taken pains to understand the value. He speedily, but cautiously, turned his first gains into second advantages; retained, without a single deviation, his extreme parsimony; and thus advanced by degrees into larger transactions and incipient wealth. The final result was that he more than recovered his lost possessions, and died an inveterate miser, worth £60,000."

He gained "money," and he "purchased" cattle. In the simple transaction which has been recorded of the first exchange of the prodigal's labor for capital, we find the circumstances which represent every exchange of labor for capital. The prodigal wanted meat and drink, and he gave labor in exchange for meat and drink; the capitalist wanted the produce of labor—he wanted a new value bestowed upon his coals by labor—and he gave meat and drink in exchange for the labor which the prodigal had to give. But the prodigal wanted something beyond the meat and drink which was necessary for the supply of the day. He had other immediate necessities beyond food, and he had

determined to accumulate capital. He therefore required "a few pence" in addition to the "meat and drink." The capitalist held that the labor performed had conferred a value upon his property, which would be fairly exchanged for the pence in addition to the food, and he gave, therefore, in exchange, that portion of his capital which was represented by the money and by the food. This blending of one sort of consumable commodity, and of the money which represented any other consumable commodity which the money could be exchanged with, was an accident arising out of the peculiar circumstances in which the prodigal happened to be placed. In ordinary cases he would have received the money alone; that is, he would have received a larger sum of money to enable him to exchange for meat and drink, instead of receiving them in direct payment. It is clear, therefore, that as the money represented one portion of the consumable commodities which were ready to pay for the labor employed in giving a new value to the coals, it might represent another portion—the meat, for instance, without the drink; or it might represent all the consumable commodities, meat, drink, lodging, clothes, fuel, which that particular laborer might want; and even represent the accumulation which he might extract out of his self-denial as to the amount of meat, drink, lodging, clothes, and fuel, which he might require as a consumer; and the farthing saved out of his money-payment might be the nest-egg which was to produce the increase out of which he purchased cattle, and died a rich miser.

We may be excused for calling attention to the fact, which is a very obvious one, that if the laborer, whose story we have told, had received a portion of the coals upon which he had conferred a new value in exchange for the labor which produced that value, he would have been paid in a way very unfavorable for production. It would have

required a new labor before the coals could have procured him the meat, and drink, and lodging of which he had an instant want; and he therefore must have received a larger portion of coals to compensate for his new labor, or otherwise his labor must have been worse paid. There would have been unprofitable labor, whose loss must have fallen somewhere—either upon the capitalist or the laborer in the first instance, but upon both ultimately, because there would have been less production. All the unprofitable labor employed in bringing the exchange of the first labor for capital to maturity would have been so much power withdrawn from the efficiency of the next labor to be performed; and therefore production would have been impeded to the extent of that unprofitable labor. The same thing would have happened if, advancing a step forward in the science of exchange, the laborer had received an entire payment in meat and drink, instead of a portion of the coals, which he could have exchanged for meat and drink. Wanting lodging, he would have had to seek a person who wanted meat and drink in exchange for lodging, before he could have obtained lodging. But he had a few pence—he had money. He had a commodity to exchange that he might divide and subdivide as long as he pleased, while he was carrying on an exchange—that is, he might obtain as much lodging as he required for an equivalent portion of his money. If he kept his money, it would not injure by keeping, as the food would. He might carry it from place to place more easily than he could carry the food. He would have a commodity to exchange, whose value could not be made matter of dispute, as the value of meat and drink would unquestionably have been. This commodity would represent the same value, with little variation, whether he kept it a day, or a week, or a month, or a year: and therefore would be the only commodity whose retention would advance his design of

accumulating capital with certainty and steadiness. It is evident that a commodity possessing all these advantages must have some intrinsic qualities which all exchangers would recognize—that it must be a standard of value—at once a commodity possessing real value, and a measure of all other values. This commodity exists in all commercial or exchanging nations in the shape of coined metal. The offices and functions of money, the relations which it sustains to every civilized society, its immediate agency in increasing production and facilitating distribution, are subjects concerning which many erroneous ideas are entertained, and many absurd and unfounded statements promulgated. Upon these topics the most distinguished writers on political economy and finance disagree most widely. The true position, however, we believe, has been recently taken for the first time, by an eminent American writer,* who clearly shows, that money, considered simply as a machine—an instrument—for effecting changes in ownership, ranks first among the labor-saving inventions of man, and that as the producer of motion, and the instigator of industrial effort, it sustains to society the same relation which food sustains to the body. That this is really the case, we shall attempt to show in the succeeding chapter.



ANCIENT ROMAN MONEY.

* Henry C. Carey.

CHAPTER VII.*

MACHINERY OF EXCHANGE.—EXCHANGE LIMITED IN NEW COUNTRIES.—CHANGE IN PLACE.—CHANGE IN FORM.—CHANGE IN OWNERSHIP.—ESSENTIAL QUALITIES OF A CIRCULATING MEDIUM.—ADVANTAGES POSSESSED BY GOLD AND SILVER FOR USE AS MONEY.—EXCHANGE IN KIND.—MONEY AN INSTRUMENT FOR SAVING LABOR. EFFECTS OF AN ABUNDANT SUPPLY OF GOLD AND SILVER.—SIBERIA, PERU, AND CALIFORNIA POOR.—ENGLAND RICH.—TRUE OFFICES OF MONEY.

EXCHANGE, like every other industrial operation, can only be carried on by the use of certain instrumental agencies, or machinery, upon the completeness of which the perfection of the result depends. These instrumentalities are of three kinds, namely, those by which we effect change of place—those by which we effect change of form, and lastly, those by which we effect change of ownership. The machinery which we employ to effect change in place, is beasts of burden, ships, bridges, roads and canals, wagons, and cars; the machinery necessary to effect changes in form, is spades and axes, plows, wheels, steam-engines, mills, furnaces, etc. The machinery required to effect change in ownership, is money.

The progress by which these various instrumentalities have been perfected has been gradual—the result mainly of experience and necessity. The laws and principles upon which they depend are common to all, and united and

* The Editor is indebted in great part for the following chapter to Henry C. Carey, Esq., of Philadelphia, whose able pamphlet on "Money," published in 1855, has been used with the permission and sanction of the author.

co-operative they constitute the structure of all commercial and industrial transactions. As no combination of machinery moves perfectly unless its several parts are well fitted to each other, and proportioned to the whole, so the great system of exchange works imperfectly, and ceases to stimulate production, distribution, and consumption, to the highest degree, unless all its instrumentalities are well adapted to the operations which they are required to facilitate and discharge. This will appear obvious, by examining the three forms of machinery employed in exchange, and their intimate connection with each other, somewhat in detail.

Exchange among rude nations, or in the early settlements of any country, must necessarily be limited on account of the obstacles which restrict intercommunication among individuals, and oppose change of place among objects. A wide and rapid river, an arm of the sea, a desert, or a wilderness, have often proved a complete barrier, cutting off all intercourse between two contiguous tribes or nations. In Russia, at this present time, and the same was true in Western Europe during the middle ages, owing to the lack of facilities for intercommunication, the bulk of all exchanges for particular sections of country are made altogether and at one place, by means of fairs held at considerable intervals of time. During the time between the occurrence of these fairs, comparatively few exchanges are effected. In the early settlement of the United States, the roads were mere Indian trails, or bridle paths, and all transport of merchandise was made in packs, borne upon the shoulders of men, or loaded upon horses. When the Rev. Mr. Hooker and his little company journeyed from Massachusetts Bay to the valley of the Connecticut to found the settlement of Hartford, several weeks were consumed in traversing a section of country, which can now be passed over in half a day. When the settlement had been established and

the culture of the earth commenced, it is obvious that but few exchanges could have taken place between the new colony of Connecticut and the people of Boston; since the time and labor expended in transporting the articles to be exchanged, would nearly equal, or exceed their value. If the people of Hartford proposed to exchange corn for axes, or nails, with the merchant at Boston, the owner of the grain would receive but a very small proportion of the value paid by the merchant, while the latter would receive but a small proportion of the value of the grain paid by the agriculturalists: the transporter in both instances coming between the producer and consumer to absorb the largest proportion of the value of the articles exchanged. In the fourteenth, fifteenth, and sixteenth centuries, the Venetians, the Florentines, the Genoese, and the Dutch, were the common carriers of the produce and merchandise of all the nations of Western Europe, and thereby gained immense wealth. We nowhere read, however, that the other nations, whose merchandise and productions were thus transported, attained to any high degree of prosperity during this period. On the contrary, they were poor, and so continued until the producers and consumers perceived the necessity of so perfecting the machinery of exchange that the bulk of the profit should not accrue to the intermediate agents—the transporters. When progress has once commenced in this direction, the Indian trail is converted into a road, the ford-way gives place to a bridge, and the frail canoe to a commodious and gallant vessel. Goods are no longer transported upon the shoulders of men, or the backs of horses, but in wagons, and these in turn, at a later day, are succeeded by rail-roads and canals. With every facility thus afforded, the cost of transportation is diminished, the producer and consumer are brought nearer to each other; and the profits of both being increased, the amount of their ex-

changes increase; production is every where stimulated, population becomes concentrated, accumulation becomes easy, and labor is in demand.

Equally necessary is it for the perfection of the great system of exchange, that the machinery by which change of form in matter is effected should be complete as possible. It is immaterial to the consumer whether the high price he pays for his article of consumption results from costliness of manufacture, or costliness of transportation. In either case, an undue enhancement of value, limits demand, and consequently exchange and production are restricted. In those countries where the application of machinery to effect changes in form is rude and imperfect, or no machinery is used at all, the amount of labor that intervenes between the production of the raw material and the consumption of the manufactured product, is frequently immense. The price of labor, equally with the price of transportation in the former instance, is chargeable upon the value of the article when in the market, and nearly equals that value. India formerly supplied the world with cotton-cloth, but the labor of producing the fabric from the fiber was so enormous and expensive, even in a country where wages are merely nominal, that *comparatively* little cloth was used or consumed. Exchange consequently with India for this article was limited.

Now, by the perfection of machinery, an operative at Lowell can spin more cotton in a single day than three thousand Hindoo artisans can accomplish in the same time. And it has been calculated that the machinery of Great Britain alone produces more cloth each week than the whole population of the globe could by their unassisted labor produce in the same time, working night and day. This perfection of machinery has been followed by a very great reduction of price, and a better article of cloth may now be purchased for six or eight cents per yard than could formerly have

been obtained for thirty or forty cents. Reduction of price has increased the demand for the manufactured product beyond all precedent, and this, in turn, has been followed by an increased demand for labor, and for the supply of raw material. Thus the labor of many persons has been brought into use, which would otherwise have been wasted or misapplied, and many natural productions are rendered available, which would otherwise have been worthless. The former producer finds that his time is better occupied in increasing the quantity of cotton rather than in manufacturing it, and he thereby increases his exchanges. The three thousand Indians whose labor is performed by one person now find it more profitable to impart value to other substances which they can exchange for cloth rather than manufacture for themselves; and thus an immense addition of industrial capital is added to the aggregate before existing. Every improvement in machinery perfects the product manufactured or decreases the cost—results invariably attended with increased exchanges, increased production and consumption, and a rapid increase of the power of accumulation. So long as India, with imperfect machinery for effecting the change of cotton into cloth, continued to supply the world, the production, consumption, accumulation, and exchange involved were comparatively unimportant; but now, when by the aid of machinery one man is enabled to accomplish the work of three thousand in the same business, the production, manufacture, and exchange of cotton and its products require the skill, labor, and capital of millions, while the accumulation consequent involves the profit and wealth of nations.

Take another example as given by Mr. Carey. In the early stages of society, the quantity of labor that intervenes between the production of grain and the consumption of bread is very great. The producer has to grind his rye or his wheat between stones, and a considerable portion of the

time is thus occupied, when it could be better employed in increasing the quantity of grain. By degrees the grist-mill comes nearer to him, and he saves much time by going to it, although far distant. Population and wealth increases. A new mill is established in his immediate neighborhood, and he now exchanges directly with the miller, saving nearly all the time he had before wasted on the road; and the consumers of food by whom he is surrounded now obtain nearly all the wheat given for cloth, while its producer obtains nearly all the cloth given for the wheat.

The intimate relation existing between commerce, or the machinery used for effecting change in place and manufactures, or the machinery employed for effecting changes in form, is strikingly shown by the manner in which any thing that increases the facilities of transit acts as a stimulus upon manufactures; and, on the other hand, every great improvement in manufactures necessarily leads to an increased development of commerce. More horses are now employed in the city of New York, in connection with the various rail-roads, than were formerly used upon all the stage routes leading directly to New York. As a consequence of this increased number of horses within the city, increased amounts of hay are required from the country for their support. This hay must be transported, and increased facilities of transportation have therefore been created. But hay is an article too bulky to be sent for any considerable distance as it comes from the field or the barn. It must be pressed and made into bales; and this new requirement has been so great, that within a few years several large establishments have been built for a new business—the manufacture of hay-presses—employing directly the services of a large number of carpenters, blacksmiths, and laborers, and indirectly all concerned in preparing or transporting the wood and iron from which the presses are constructed.

An immense traffic in eggs, fruit, fish, and fresh provisions is continually carried on between the great cities of our Atlantic seaboard and the distant States of the West by means of the facilities afforded by rail-way conveyance, all of which business, with nothing but the old wagons to depend on, would be obviously impossible.

Notwithstanding the perfection attained to in the construction of machinery for effecting changes in the place and form of material objects, but few exchanges could be made, unless some standard were adopted, known and recognized by all, by which all other values might be compared and measured, and through which exchange in ownership might be accomplished. The difficulty and inconvenience which, as we have before shown, the prodigal would have experienced had he received a remuneration for his labor, either in coal, in food, or in drink, would be experienced in a greater or less degree by every other person who is obliged to effect his exchanges in kind, as salt for wheat, sugar for iron, etc. The farmer may not require iron utensils of the blacksmith or shoes of the shoemaker, and yet the latter may have nothing else to offer him for his wheat. Again, if the blacksmith or the shoemaker desire clothing, it is by no means certain that the cloth-maker requires iron or shoes, although he would gladly exchange cloth for cotton or wool. In short, so insuperable are the difficulties of effecting any system of exchanges in kind, that some machinery for facilitating these transactions has always been devised, even by the rudest nations. We designate such machinery employed for facilitating exchanges as a circulating medium—money.

Among the North American Indians, the circulating medium was wampum and beaver-skins; among the natives of West Africa, it consists of small shells, called cowries. Our Anglo-Saxon ancestors used slaves and cattle as the mediums of exchange; and going back to remote periods, we find in

the time of Homer, that while the price of the armor of Diomede was nine oxen, that of Glaucus cost him one hundred head of cattle. In the early history of the American colonies, codfish and tobacco were not unfrequently used as a circulating medium.

Among all civilized or commercial nations, however, as wants have multiplied, and the number of exchanges have increased, the various articles used as circulating mediums have given place to pieces of coined or stamped metal, which we designate as money. Different metals have been used at different times for this purpose. Iron was established as money among the Spartans by Lycurgus; brass was used by the Romans; and in modern times platinum has been coined by the Russians. The metals, however, which most perfectly effect the desired object of facilitating exchanges, are gold and silver, and these two, by almost universal consent, have now been established as the standards by which all other values are to be compared or measured.

In order that any substance should be thus universally used and recognized as a medium of exchange, and a standard of comparison for all other values, it is necessary that it should possess the following essential qualities and properties:—

1. It must be an article of real and intrinsic value, representing the value of the labor required to produce it, or the value of the use to which it can be applied.

2. Its value must also be permanent and invariable; or nearly so. Hence it could not be an animal or a vegetable production, the value of which is constantly fluctuating, through the agency of causes over which man has little or no control. No one would willingly exchange his commodities or his labor for any kind of a circulating medium which a change in the weather might destroy, or which would be

certain to decay under any circumstances, within a given period.

3. Convenience demands that the substance of the circulating medium should comprise within a small bulk a large value; in other words, it should be an article of high price; if iron were adopted as the money metal, and circulated at its current value, it would be necessary to transport a ton of this useful substance to discharge a debt of twenty or thirty dollars.

4. As the standard to be universal, must represent the measure of the value of all other commodities, small and great, it is requisite that it should itself be capable of subdivision without loss or detriment. All the parts of a divided beaver-skin do not possess the value of the skin entire, and a precious stone of large size has a value greatly exceeding an equal bulk of smaller gems. The value of a certain portion of gold or silver, on the contrary, is the same, whether it consists of large or small pieces. Platinum, although a precious metal, can not be melted in our furnaces, and is most valuable when in the form of ingots, from which it may be forged into useful forms. In the form of grains, or small pieces, its value is diminished, since it can not be again united into a large and compact mass, unless subjected to an expensive chemical process.

5. The nature of the substance must be such, also, that its value may easily be verified and determined.

Finally, that any substance should be universally used as a circulating medium, it must unite in itself all these qualities which will cause it to be universally desired for such purpose, and these qualities are alone, of all other substances, possessed in the highest degree by gold and silver.

A portion of gold or silver possesses a real value in itself, which represents the labor employed in producing it; and in the form of coin, it represents also a measure of other

value, because the value of the coin has been determined by the sanction of some authority which all admit; that authority is most conveniently expressed by a government, as the representative of the aggregate power of society. The metal itself, unless in the shape of coined money, would not always represent a definite value; because it might be depreciated in value by the mixture of baser or inferior metals, unless it bore the impress of authority to determine its value. The exchangers of the metal for other articles could not without great loss of labor be constantly employed in reducing it to the test of value, even if they had the knowledge and skill requisite for so doing. It used to cost a thousand pounds a year to the Bank of England for the wages of those who weighed the gold coin brought to the bank; and it has been estimated that 30,000 sovereigns pass over the bank counter daily. A machine is now used at the bank, which separates the full weighted coins and the light ones, at the rate of 10,000 per hour. In ancient Greece, a piece of gold was once stamped with the figure of an ox, to indicate that it would exchange for an ox. In modern England, a piece of gold called a sovereign, represents a certain weight in gold uncoined, and the government stamp indicates its purity; while the perpetual separation of the light sovereigns from those of full weight, affords a security that very few light ones are in general circulation. A dollar purchases so many pounds' weight of an ox, and a whole ox purchases so many dollars. The great use of the coined metal is to save labor in exchanging the ox for other commodities. The money purchases the ox, and a portion of the ox again purchases some other commodity, such as a loaf of bread from the baker, who obtains a portion of the ox through the medium of the money, which is the standard by which the value of the bread and the beef are compared.

The great English poetical satirist, Pope, in conducting his invective against the private avarice and corruption of his day, imagines a state of things in which, money and credit being abolished, ministers would bribe and be bribed in kind. It is a true picture of what would be universal, if the exchanges of men resolved themselves into barter :

" A statesman's slumbers, how the speech would spoil—
Sir, Spain has sent a thousand jars of oil ;
Huge bales of British cloth blockade the door ;
A hundred oxen at your levee roar."

Upon no subject, however, as before stated, has there been a greater difference of opinion entertained and expressed, than in regard to the value and utility of money, considered simply as an instrument for developing and strengthening the productive forces of society. Many persons find it extremely difficult to conceive how money in itself can be invested with any higher value than that which naturally belongs to it as an article of industrial or artistic utility. The value of an ox, it may be said, is no greater, whether we designate the ox as money or as beef; and the value of a given portion of gold is the same whether it takes the form of a sovereign* or ornaments the frame of a looking-glass. Even Adam Smith, in his "Wealth of Nations," tells us "that the gold and silver money which circulates in any country, and by means of which the produce of its land and labor is annually circulated and distributed to the proper consumers, is all dead stock." But Adam Smith and others who have used these arguments, overlooked the great fact, that money is an *instrument*, or a *machine*, as much so as a ship, a steam-engine, or a newspaper, and so far as the development of trade, manufactures, and commerce is concerned, more efficacious than either of these other instruments or machines. A ship or a steam-engine

has a value independent of the value of the materials and labor employed in their construction; a value proportioned to the labor they can perform, and the necessity which exists for such labor. During the embargo which preceded the war of 1812, American vessels rotted at their wharfs, and their value was not equal to the cost of the materials used in their construction; but during the famine year of 1847 in Europe, the proceeds of a single voyage of some vessels equaled or exceeded their cost. A newspaper which sells for a penny in New York, has been afterward sold for a dollar at the mines in California; the price paid in both instances being proportioned to the necessity existing for its use, and in the latter case was independent of the actual cost.

So with money; its value in society is proportioned only by the labor it performs, or the office it executes, and as a labor-saving machine its relative value in promoting the production, consumption, and accumulation of a community, is far greater than that performed by either ships or steam-engines. The operations of the three are in character identical, viz., the removal of obstacles between the producer and consumer; but money has this advantage over the other machines, in the fact that a limited amount, after effecting more exchanges and economizing more labor for a succession of years than a great number of ships or steam-engines could accomplish, remains entire and nearly unimpaired, while the ships and engines are either destroyed by use or depreciated in value.

"A ship," says Mr. Carey, "that has cost forty or fifty thousand dollars can not effect exchanges between men on the opposite sides of the Atlantic, to an extent exceeding five or six thousand tons per annum, whereas a furnace of the same cost will effect the transmutation of thirty thousand tons weight of coal, ore, limestone, food and clothing into

iron; but the exchanges effected by its aid will not exceed the value of a hundred or a hundred and fifty thousand dollars. Let these be compared with the exchanges effected in a year by the help of fifty thousand dollars' worth of little white pieces representing labor, to the extent of three or five cents, labor which by their help is gathered up in a heap, and then divided and subdivided day after day throughout the year, and it will be found that the service rendered to society in economizing labor, by each dollar's worth of money, is greater than is rendered by hundreds, if not thousands, employed in manufactures, or tens of thousands in ships or railroads."

To ascertain the relative value of the three great instrumentalities employed in effecting exchanges, viz., the machinery for producing changes in place, in form and in ownership, "it is only necessary to calculate the amount of exchange performed by a fleet of ships, a collection of railroads, or a city of factories, each of which may have cost ten or twenty millions, and then contrast it with the service rendered by even a single million of money, constituting the basis upon which rests the operations of a community. The total amount of the precious metals circulating in the six States of New England, can not very greatly exceed a million each; but if we take it altogether at ten millions, we obtain no more than the cost of a single road like that from Boston to Albany, or that of two hundred ships of a thousand tons each. With a population of three millions of people, the daily exchanges will be put at a very low figure if we place them at ten millions, and it would be perhaps safe to make the amount much greater; but at that sum the exchange would amount to more than three thousand millions per year, each dollar of which involves as much profit and loss to the parties concerned in it, as any of those performed by the help of the rail-road or the ship. Next let us

consider the effect which would result from the withdrawal of five of these millions of money from their present employment, followed as it would be by a paralysis of the industry of the whole of these three millions of people, and compare with it the effect that would be produced by a fire that should at once annihilate five millions' worth of houses and merchandize, or a storm which should sink a half dozen ocean steamers like the Arctic; and we shall see that of all the machinery in use among men, there is none which performs the hundredth part of the service proportioned to its cost, that is performed by money.

"We are told, however, that the only effect of an increased supply of gold and silver is that of 'heightening the price of commodities, and obliging every one to pay more of those little yellow or white pieces for every thing he purchases.' Were this really the case, it would be somewhat extraordinary to see money always, century after century, passing in the same direction to the countries that are rich from those that are poor, and so poor that they can not afford to keep as much of it as is necessary for their own exchanges. The gold of Siberia leaves a country in which so little circulates that labor and its products are at the lowest prices, to find its way to St. Petersburg, where it will purchase much less labor, and much less of wheat and hemp; but even here it can not stay, and it travels abroad so rapidly that the people of Russia are compelled to use paper money to enable them to make their exchanges. So it is in all countries that export raw produce; and so it must be, because it will go to those countries that will buy such produce, and finish it to be ready for use; and in this latter money will be always at a low rate of interest, while its owner will be enabled to purchase cheaply clothing and other of the conveniences and comforts of life.

"Every commodity yielded by nature to man tends to-

ward those places at which it has the highest utility, and there it is that the labor value of the finished article will be found the smallest. Wheat tends toward the grist-mill, and there it is that flour is the cheapest. Cotton and wool tend toward the mills at which they are to be spun and woven, and there it is that the smallest quantity of muscular effort will command a yard of cloth. Caoutchouc tends toward those places where India rubber shoes are made, and there it is that shoes are cheap. On the other hand, it is where cotton has the least utility—on the plantation—that cloth has its highest value; and therefore it is that we see nations so universally prospering, where the spindle and the loom are brought to the neighborhood of the plow and the harrow, to give utility to their products.

“Precisely similar to this are the facts observed in regard to the precious metals, which every where tend to those places where they have the highest utility—those at which men are most able to combine their efforts for rendering available all the raw products of the earth—those in which the value of land is high, and interest for the use of money low. They tend to leave those places in which their utility is least, and in which combination of action least exists—those in which the price of land is low, and the rate of interest high.

“If we compare Mexico, Peru, California, or Siberia, where gold or silver is produced most abundantly, but where money is scarce, interest high, land of little value, and but little combination of action present to give utility to their metallic products with England, where the reverse of all these innumerable circumstances exists, we shall see that an increase in the supply of money, so far from causing men to give two pieces for an article that before could have been had for one, has, on the contrary, the effect of enabling them

to obtain for one piece the commodity that before had cost them two.

“Experience teaches every man that when money, the machine by the help of which exchanges are made from hand to hand, circulates freely, he becomes more prosperous from day to day, whereas when it is scarce and circulates slowly, he becomes less prosperous. It is not capital that is needed, but money, the machine by the help of which the products of labor and capital are kept in motion, and without which they can not move, except in the fashion of primitive times, when skins were traded for knives and cloth. The actual capital of the United States, in houses, lands, factories, furnaces, mines, ships, roads, canals, and other similar property, has increased within the last three years to the extent of at least a thousand millions of dollars; yet we see every where railroads half finished, and unlikely soon to be finished, although laborers are seeking employment; mills likely to be stopped for want of demand for their products; laborers unable to sell their labor, and men of business every where compelled to curtail their operations because of the difficulty experienced in collecting their debts. Why is this so? Not, certainly, because of any diminution of capital, for that is greater than it has ever been, but from the want of the machinery with which to move capital and labor—money. This money now leaves the United States, and collects in Europe.

“Money, therefore, takes its place, as one of the great instruments of progress and civilization, side by side with the ship, the steam-engine, the printing-press, and the powerloom. Its duties are, however, less specific than those of all other machines, and its adaptation to purposes of utility more manifold and various. Capable of minute subdivision without detriment to itself, it purchases alike the food of the humble laborer, and the products of empires; it is the instrument of secret charity, and of ostentatious munificence;

the agent of religious efforts, and the founder of States. It bids commerce spread its sail on every ocean, arms and encourages enterprise to combat and make subservient the elements of nature, concentrates and combines the forces of industry, and makes free the blessings of education. 'Money is to society, what fuel is to the locomotive, or food to the animal, the producer of motion—whence results power.' Deprive the one of fuel, and the combinations of machinery become powerless—withhold sustenance from the other, and paralysis and death follows. So with money, when it circulates freely all the elements of society are in motion, production is stimulated, labor is in the ascendant. When it is withdrawn from circulation, apathy succeeds activity, production is diminished, business stagnates; the laborer instead of being the equal is now the slave of the capitalist; the rich become richer, and the poor poorer. The comparison between the offices sustained by food to the body and those of money to society may be carried still further. Thus in order that food may give motion and produce power, it must be digested and pass gradually through a long series of complex organic vessels, by whose help it is gradually assimilated and made to yield support to the whole system, having done which it passes gradually off, in great measure by insensible perspiration. So it is with gold and silver. That they may be the cause of motion and power, it is required that they, too, should be digested and pass gradually through the system, some portions to be absorbed and retained, while others pass gradually and almost insensibly off to be applied to the purchase of other commodities. In default of this, the supplies of California can be of no more service to this country than would be supplies of food to a man suffering under dysentery or cholera. The more the latter eats, the more certain would be the approach of death; and the more gold that

comes from California the poorer we shall become under a system that drains it from the country, that closes the mills and furnaces of the nation, that destroys the power of association—and that causes a demand for exportation of all the gold we receive ; *for with every step in this direction we are increasing the power of other nations to produce cheaply both iron and cloth, while diminishing our own.*

“It is by means of association and combination of effort that man advances in civilization. Association brings into activity all the various powers, mental and physical, of the beings of which society is composed, and thus it is seen that individuality grows every where with the growth of combination. Association enables the many who are weak and poor, to triumph over the few that are rich and strong, and thus it is that we see man becoming more free with every advance in wealth and population. To enable man to associate, there is required an instrument, by the help of which the process of composition, decomposition, and re-composition of the various forces may readily be effected, so that while all unite to produce the effect desired, each may have his share of the benefits thence resulting. That instrument was furnished in those metals which stand almost alone in the fact that, as Minerva sprang fully armed from the head of Jove ; they, whenever found, come forth ready, requiring no elaboration, no alteration to fit them for the great work for which they were intended, that of enabling men to combine their efforts for attaining the highest degree of civilization and progress. Of all the instruments at the command of men, there are none that tend in so large a degree to promote individuality on the one hand and association on the other, as do gold and silver—properly therefore denominated, the precious metals.”*

* Henry C. Carey.

CHAPTER VIII.

IMPORTANCE OF CAPITAL TO THE PROFITABLE EMPLOYMENT OF LABOR.—CONTRAST BETWEEN THE PRODIGAL AND THE PRUDENT MAN: THE DUKES OF BUCKINGHAM AND BRIDGEWATER.—MAKING GOOD FOR TRADE.—UNPROFITABLE CONSUMPTION.—WAR AGAINST CAPITAL IN THE MIDDLE AGES.—EVILS OF CORPORATE PRIVILEGES.—CONDITION OF THE PEOPLE UNDER HENRY VIII.

BUT whatever difference of opinion may be entertained in respect to the relation which money sustains to the various productive forces of every civilized society, we think our readers will willingly yield their assent to the conclusion which we have endeavored to illustrate, namely, that accumulation, or capital, is absolutely essential to the profitable employment of labor; and that the greater the accumulation the greater the extent of that profitable employment. This truth, however, has been denied altogether by some speculative writers; and, what is more important, has been practically denied by the conduct of nations and individuals in the earlier stages of society; and is still denied by existing prejudices, derived from the current maxims of former days of ignorance and half-knowledge. With the speculative writers we have little to do. When Rousseau, for instance, advises governments not to secure property to its possessors, but to deprive them of all means of accumulating, it is sufficient to know that the same writer advocated the savage state, in which there should be no property, in preference to the social, which is founded on appropriation. Knowing this, and being convinced that the savage state, even with imperfect appropriation, is one of extreme wretch-

edness, we may safely leave such opinions to work their own cure. For it is not likely that any individual, however disposed to think that accumulation is an evil, would desire, by destroying accumulation, to pass into the condition described by John Tanner, of a constant encounter with hunger in its most terrific forms: and seeing, therefore, the fallacy of such an opinion, he will also see that, if he partially destroys accumulation, he equally impedes production, and equally destroys his share in the productive power of capital and labor working together for a common good in the social state.

But, without going the length of wishing to destroy capital, there are many who think that accumulation is a positive evil, and that consumption is a positive benefit; and, therefore, that economy is an evil, and waste a benefit. The course of a prodigal man is by many still viewed with considerable admiration. He sits up all night in frantic riot; he consumes whatever can stimulate his satiated appetite; he is waited upon by a crowd of unproductive and equally riotous retainers; he breaks and destroys every thing around him with an unsparing hand; he rides his horses to death in the most extravagant attempts to wrestle with time and space; and when he has spent all his substance in these excesses, and dies an outcast and a beggar, he is said to have been a hearty fellow, and to have "made good for trade." When, on the contrary, a man of fortune economizes his revenue—lives like a virtuous and reasonable being, whose first duty is the cultivation of his understanding—eats and drinks with regard to his health—keeps no more retainers than are sufficient for his proper comfort and decency—breaks and destroys nothing—has respect to the inferior animals, as well from motives of prudence as of mercy—and dies without a mortgage on his lands; he is said to have been a stingy fellow who did not know how

to "circulate his money." To "circulate money," to "make good for trade," in the once common meaning of the terms, is for *one* to consume unprofitably what, if economized, would have stimulated production in a way that would have enabled *hundreds*, instead of one, to consume profitably. Let us offer two historical examples of these two opposite modes of making good for trade, and circulating money. The English Duke of Buckingham, having been possessed of an income of about two hundred and fifty thousand dollars a-year, died in 1687, in a remote inn in Yorkshire, reduced to the utmost misery. After a life of the most wanton riot, which exhausted all his princely resources, he was left at the last hour, under circumstances which are well described in the following lines by Pope:

"In the worst inn's worst room, with mat half hung,
The floors of plaster, and the walls of dung,
On once a flock bed, but repair'd with straw,
With tape-tied curtains never meant to draw,
The George and Garter dangling from that bed
Where tawdry yellow strove with dirty red;
Great Villiers lies. * * * *
No wit to flatter, left of all his store,
No fool to laugh at, which he valued more,
There, victor of his health, of fortune, friends,
And fame, this lord of useless thousands ends."

Contrast the course of this unhappy man with that of the Duke of Bridgewater, who devoted his property to really "making good for trade," by constructing the great canals which connect Manchester with the coal countries and with Liverpool. The Duke of Buckingham lived in a round of sensual folly: the Duke of Bridgewater limited his personal expenditure to two thousand dollars a-year, and devoted all the remaining portion of his revenues to the construction of a magnificent work of the highest public utility. The

one supported a train of cooks and valets and horse-jockeys; the other called into action the labor of thousands, and employed in the direction of that labor the skill of Brindley, one of the greatest engineers that any country has produced. The one died without a penny, loaded with debt, leaving no trace behind him but the ruin which his waste had produced: the other bequeathed almost the largest property in Europe to his descendants, and opened a channel for industry which afforded, and still affords, employment to thousands.

When a mob amused themselves by breaking windows, as was once a common recreation in England on an illumination night, by way of showing the amount of popular intelligence, some were apt to say they have "made good for trade."

Is it not evident that the capital which was represented by the unbroken windows was really so much destroyed of the national riches when the windows were broken? for if the windows had remained unbroken, the capital would have remained to stimulate the production of some new object of utility. The glaziers, indeed, replaced the windows; but there having been a destruction of windows, there must have been a necessary retrenchment in some other outlay that would have afforded benefit to the consumer. Doubtless, when the glazier is called into activity by a mob breaking windows, some other trade suffers; for the man who has to pay for the broken windows must retrench somewhere; and if he has less to lay out, some other person has also less to lay out. The glass-maker, probably, makes more glass at the moment, but he does so to exchange with the capital that would otherwise have gone to the maker of clothes or of furniture; and there being an absolute destruction of the funds for the maintenance of labor by an unnecessary destruction of what former labor has produced, trade

generally is injured to the extent of the destruction. Some now say that a fire makes good for trade. The only difference of evil between the fire which destroys a house and the mob which breaks the windows is, that the fire absorbs capital for the maintenance of trade or labor in the proportion of a hundred to one when compared with the mob. Some say that war makes good for trade. The only difference of pecuniary evil (the moral evils admit of no comparison) between the fire and the war is, that the war absorbs capital for the maintenance of trade or labor in the proportion of a million to a hundred, when compared with the fire. If the incessant energy of production were constantly repressed by mobs, and fires, and wars, the end would be that consumption would altogether exceed production; and finally the producers and the consumers would both be starved into wiser courses, and perceive that nothing makes good for trade but profitable industry and judicious expenditure. Prodigality devotes itself too much to the satisfaction of present wants; avarice postpones too much the present wants to the possible wants of the future. Real economy is the happy measure between the two extremes; and that only "makes good for trade," because, while it carries on a steady demand for industry, it accumulates a portion of the production of a country to stimulate new production. That judicious expenditure consists in

"The sense to value riches, with the art
To enjoy them."

Lessing, in one of his Eastern fables, thus pleasantly illustrates the folly of continued accumulation, without properly enjoying it. "It was a sultry day, and an avaricious old man who had hoarded a large amount was toiling away and wasting his little remaining strength, when a heavenly apparition stood before him; 'I am Solomon,' it said, with a friendly

voice; 'what are you doing?' 'If you are Solomon,' answered the old man, 'how can you ask? When I was young, you sent me to the ant, and told me to consider her ways; and from her I learned to be industrious and gather stores.' 'You have only half learned your lesson,' said the spirit; 'go once more to the ant, and learn to rest the winter of your years and enjoy your collected treasures.'"

The fashion of "making good for trade" by unprofitable consumption is a relic of the barbarous ages. In the twelfth century a count of France commanded his vassals to plow up the soil round his castle, and he sowed the ground with coins of gold to the amount of fifteen hundred guineas, that he might have all men talk of his magnificence. Piqued at the lordly prodigality of his neighbor, another noble ordered thirty of his most valuable horses to be tied to a stake and burned alive, that he might exhibit a more striking instance of contempt for accumulation. In the latter part of the fourteenth century, a Scotch noble, Colin Campbell, on receiving a visit from the O'Neiles of Ireland, ostentatiously burned down his house at Inverary upon their departure; and an Earl of Athol pursued the same course in 1528, after having entertained the papal legate, upon the pretense that it was "the constant habitude of the Highlanders to set on fire in the morning the place which had lodged them the night before." When the feudal lords had so little respect for their own property, it was not likely that they would have much regard for the accumulation of others. The Jews, who were the great capitalists of the middle ages, and who really merit the gratitude of Europeans for their avarice, as that almost alone enabled any accumulation to go forward, and any production to increase, were, as it is well known, persecuted in every direction by the crown, by the nobles, by the people. When a solitary farmer or abbot attempted to accumulate corn, which accumulation could

alone prevent the dreadful famines invariably resulting from having no stock that might be available upon a bad harvest, the people burnt the ricks of the provident men, by way of lessening the evils of scarcity. The consequence was, that no person thought of accumulating at all, and that the price of wheat often rose just before the harvest from five shillings a quarter to one hundred shillings.



THE HOCK-CART.

We are accustomed to read and talk of "merry England," but we sometimes fail to think how much real suffering lay beneath the surface of the merriment. Herrick, one of England's charming old lyric poets, has sung the glories of the

hock-cart—the cart that bore the full sheaves to the empty barn:

The harvest swains and wenches bound
For joy, to see the hock-cart crowned:
About the cart hear how the rout
Of rural younglings raise the shout,
Pressing before, some coming after,
These with a shout, and those with laughter.
Some bless the cart, some kiss the sheaves,
Some prank them up with oaken leaves;
Some cross the fill-horse, some with great
Devotion stroke the home-borne wheat."

Assuredly there was joy and there was devotion; for the laden cart made the difference between plenty and starvation. Before that harvest-home came there had been many an aching heart in the village hovels, for there was no store to equalize prices, and no communication to make the abundance of one district, much less of one country, mitigate the scarcity of another. It was not a question of the rise or the fall of a penny or two in the price of a loaf of bread, it was a question of bread or no bread.

During these dark periods the crown carried on the war against capital with an industry that could not be exceeded by that of the nobles or the people. Before the great charter the Commons complained that King Henry seized upon whatever was suited to his royal pleasure—horses, implements, food, any thing that presented itself in the shape of accumulated labor. In the reign of Henry III., a statute was passed to remedy excessive distresses; from which it appeared that it was no unfrequent practice for the king's officers to take the opportunity of seizing the farmer's oxen at the moment when they were employed in plowing, or as the statute says, "winning the earth"—taking them off, and starving them to death, or only restoring them with new and enormous exactions for their keep. Previous to the

Charter of the Forest no man could dig a marl-pit on his own ground, lest the king's horses should fall into it when he was hunting. As late as the time of James I., we find, from a speech of the great Lord Bacon, that it was a pretty constant practice of the king's purveyors to extort large sums of money by threatening to cut down favorite trees which grew near a mansion-house or in avenues. Despotism, in all ages, has depopulated the finest countries, by rendering capital insecure, and therefore unproductive; inasmuch that Montesquieu lays it down as a maxim, that lands are not cultivated in proportion to their fertility, but in proportion to their freedom. In the fifteenth century, in England, we find sums of money voted for the restoration of decayed towns and villages. Just laws would have restored them much more quickly and effectually. The state of agriculture was so low that the most absurd enactments were made to compel farmers to till and sow their own lands, and calling upon every man to plant at least forty beans. All the laws for the regulation of laborers, at the same period, assumed that they should be *compelled* to work, and not wander about the country—just in the same way that farmers should be compelled to sow and till. It is perfectly clear that the towns would not have been depopulated, and gone to decay, if the accumulation of capital had not been obstructed by insecurity and wasted by ignorance, and that the same insecurity and the same waste rendered it necessary to assume that the farmer would not till and sow, and the laborer would not labor, without compulsion. The natural stimulus to industry was wanting, and therefore there was no industry, or only unprofitable industry. The towns decayed, the country was uncultivated—production languished—the people were all poor and wretched; and the government dreamed that acts of parliament and royal ordinances could rebuild the houses

and cultivate the land, when the means of building and cultivation, namely, the capital of the country, was exhausted by injustice producing insecurity.

But if the king, the nobles, and the people of the middle ages conspired together, or acted at least as if they conspired, to prevent the accumulation of capital, the few capitalists themselves, by their monstrous regulations, which still throw some dark shadows over our own days, prevented that freedom of industry without which capital could not accumulate. Undoubtedly the commercial privileges of corporations originally offered some barriers against the injustice of the crown and of the nobility : but the good was always accompanied with an evil, which rendered it to a certain extent valueless. Where these privileges gave security, they were a good ; where they destroyed freedom, they were an injury. Instead of encouraging the intercourse between one trade and another, they encircled every trade with the most absurd monopolies and exclusive privileges. Instead of rendering commerce free between one district and another, they, even in the same country, encompassed commerce with the most harrassing restrictions, which separated county from county, and town from town, as if seas ran between them. If a man of Coventry came to London with his wares, he was encountered at every step with the privileges of companies ; if the man of London sought to trade at Coventry, he was obstructed by the same corporate rights, preventing either the Londoner or the Coventryman trading with advantage.* The revenues

* These restrictions upon trade and the free practice of a profession continued in force throughout Great Britain, down to a very recent period. In the life of James Watt, who rendered such essential service to the world by his improvements in the steam-engine, we have an illustration, drawn from his own experience, of the nature of the restrictions, oppressive enactments, and usages, affecting apprentices and others as

of every city were derived from forfeitures of trades, almost all established upon the principle, that if one trade became too industrious, or too clever, it would be the ruin of another trade. Every trade was accordingly fenced round with secrets; and the commonest trade, as we know from the language of an apprentice's indenture, was called an "art and mystery." All over western Europe were the appren-

they existed in Great Britain less than a century ago. Watt, in 1756, commenced life in the employ of an instrument-maker in the city of London. After describing the skill and aptitude manifested by him for the profession he had chosen, his biographer goes on to say. "An unexpected danger at that time hung over his destiny, which might have cut short a least for a time, his prospects for further improvement in natural science, and postponed all his plans with their important consequences. This sword of Damocles was the chance of being impressed in the navy as a seaman. Watt writes in the spring of 1756, "that he avoids a very hot press just now by seldom going out," and at a later day he adds, "they now press every body they can get, landsmen as well as seamen, except it be in the liberties of the city, where they are obliged to carry them before my Lord Mayor first, and unless one be a creditable tradesman or a 'prentice, there is scarce any chance of getting off again. And if I am carried before my Lord Mayor, I durst never avow I wrought in the city, it being against their laws for any unfree man to work, even as a journeyman, within the liberties." Subsequently, Watt having completed his term of service with the instrument-maker, and escaped impressment in the navy, removed to Glasgow, Scotland, with the intention of following his profession. No sooner, however, had he manifested his intention of so doing, than the association of workmen forbid him "the exercise of his craft" in that city. "On account," says his biographer, "of his being neither the son of a burgess, nor having served a regular apprenticeship to any craft, he was resisted by tradesmen of arrogant and far more unfounded pretensions than the modest youth whom they persecuted with a sort of temporal excommunication; and was forbidden to set up even an humble shop, himself the sole tenant, within the limits of the burgh. He was only, in short, enabled to pursue his calling in Glasgow, by opening a shop within the precincts of the college, and using the designation "Instrument-maker to the University of Glasgow."

tices and journeymen taxed and ground down by arbitrary laws before they reached the dignity of freemen. Every man who had suffered these taxes, and submitted to these laws, was not willing to give up privileges so dearly bought, so that working-men who had attained to a free membership, in turn became the supporters of the very regulations that were once to them so oppressive. "In Paris," says a late writer, "before a man could become a freeman of a corporation, he must have produced a *chef-d'œuvre*. Thus, no obnoxious journeyman was ever held to have produced one; and so he was kept without the privileged pale. The freedom of a corporation became a heir-loom in certain families. The freemen heaped all kinds of rights and privileges upon themselves, to the disadvantage of workmen who did not happen to be their relations or friends. The merchants were banded in like manner. Constant broils and lawsuits arose between rival corporations—as between the tailors and the second-hand clothesmen—and a grave discussion settled the line of demarcation between a new coat and an old one. A locksmith dared not make the nails, necessary to the completion of his locks, because the manufacture of nails belonged to another corporation." All these follies went upon the presumption that "one man's gain is another man's loss," instead of vanishing before the truth, that, in proportion as the industry of all men is free, so will it be productive; and that production on all sides insures a state of things in which every exchanger is a gainer, and no one a loser.

It is not to be wondered at that, while such opinions existed, the union of capital and labor should have been very imperfect; and that, while the capitalists oppressed the laborers, in the same way that they oppressed each other, the laborers should have thought it not unreasonable to plunder the capitalists. It is stated by Harrison, an old

writer of credit,* that during the single reign of Henry VIII., seventy-two thousand thieves were hanged in England. No fact can exhibit in a stronger light the universal misery that must have existed in those days. The whole kingdom did not contain half a million grown-up males, so that, considering that the reign of Henry VIII. extended over two generations, about one man in ten must have been, to use the words of the same historian, "devoured and eaten up by the gallows."† Numerous other facts might be adduced, all tending to show the barbarity and cruelty of this period, and the utter indifference evinced by the government toward the lives as well as the property of its subjects. We read, for instance, of the execution of a Warwickshire squire, for using a coarse expression, which was erroneously said to have been applied to the king, and an innkeeper was hanged for the harmless pleasantry of saying, that he would make his son heir to the "Crown," which was the sign of his house. In the reign of Henry VIII. also, the first statute against Egyptians (gypsies) was passed. These people went from place to place in great companies—spoke a cant language, which Harrison calls Peddler's French—and were subdivided into fifty-two different classes of thieves. The same race of people prevailed throughout Europe. Cervantes, the author of "Don Quixote," says of the Egyptians or Bohemians, that they seem to have been born for no other purpose than that of pillaging. While this universal plunder went forward, it is evident that the insecurity of property must have been so great that there could have been little accumulation, and therefore little production. Capital was destroyed on every side;

* Preface to the Chronicles of Holinshed.

† A distinguished American theologian and reformer expressed a sentiment somewhat similar, when he described "hanging as the worst possible use to which a man could be put"

and because profitable labor had become so scarce by the destruction of capital, one half of the community sought to possess themselves of the few goods of the other half, not as exchangers, but as robbers. As the robbers diminished the capital, the diminution of capital increased the number of robbers; and if the unconquerable energy of human industry had not gone on producing, slowly and painfully indeed, but still producing, England would have soon fallen back to the state in which it was a thousand years before, when wolves abounded more than men. One great cause of all this plunder and misery was the oppression of the laborers.



DR. ADAM SMITH.

CHAPTER IX.

RIGHTS OF LABOR.—EFFECTS OF SLAVERY ON PRODUCTION.—CONDITION OF THE
ANGLO-SAXONS.—PROGRESS OF FREEDOM IN ENGLAND.—LAWS REGULATING LA-
BOR.—WAGES AND PRICES.—POOR-LAW.

ADAM SMITH, in his great work, "The Wealth of Nations," says, "The property which every man has in his own labor, as it is the original foundation of all other property, so it is the most sacred and inviolable. The patrimony of a poor man lies in the strength and dexterity of his hands; and to hinder him from employing this strength and dexterity in what manner he thinks proper, without injury to his neighbor, is a plain violation of this most sacred property." The right of property, in general, has been defined by another writer, M. Say, to be "the exclusive faculty guaran-

tied to a man, or body of men, to dispose, at their own pleasure, of that which belongs to them." There can be no doubt that labor is entitled to the same protection as a property that capital is entitled to. There can be no doubt that the laborer has rights over his labor which no government and no individual should presume to interfere with. There can be no doubt that, as an exchanger of labor for capital, the laborer ought to be assured that the exchange shall in all respects be as free as the exchanges of any other description of property. His rights as an exchanger are, that he shall not be compelled to part with his property, by any arbitrary enactments, without having as ample an equivalent as the general laws of exchange will afford him; that he shall be free to use every just means, either by himself or by union with others, to obtain such an equivalent; that he shall be at full liberty to offer that property in the best market that he can find, without being limited to any particular market; that he may give to that property every modification which it is capable of receiving from his own natural or acquired skill, without being narrowed to any one form of producing it. In other words, natural justice demands that the working-man shall work when he please, and be idle when he please, always providing that, if he make a contract to work, he shall not violate that engagement by remaining idle; that no labor shall be forced from him, and no rate of payment for that labor be prescribed by statutes or ordinances; that he shall be free to obtain as high wages as he can possibly get, and unite with others to obtain them, always providing that in his union he does not violate that freedom of industry in others which is the foundation of his own attempts to improve his condition; that he may go from place to place to exchange his labor without being interfered with by corporate rights or monopolies of any sort, whether of masters or workmen; and that he

may turn from one employment to the other, if he so think fit, without being confined to the trade he originally learned, or may strike into any line of employment without having regularly learned it at all. When the workingman has these rights secured to him by the sanction of the laws, and the concurrence of the institutions and customs of the country in which he lives, he is in the condition of a free exchanger. He has the full, uninterrupted, absolute possession of his property. He is upon a perfect legal equality with the capitalist. He may labor cheerfully with the well-founded assurance that his labor will be profitably exchanged for the goods which he desires for the satisfaction of his wants, as far as laws and institutions can so provide. In a word, he may assure himself that, if he possesses any thing valuable to offer in exchange for capital, the capital will not be fenced round with any artificial barriers, or invested with any unnatural preponderance, to prevent the exchange being one of perfect equality, and therefore a real benefit to both exchangers.

In the free States of the American Union and in England, the relations and the mutual dependence of labor and capital are well understood, and the natural rights pertaining to both are guaranteed, not so much by legislative enactments, as by the education and discernment of the people. Indeed, in both countries there are scarcely any legal restrictions in force, which prevent the exchange of labor with capital from being completely free and unembarrassed. It is true, that some of the most absurd and tyrannical laws regulating labor and personal rights ever enacted in England, still remain unrepealed upon her statute-book, but they are regarded for the most part as obsolete;* and to

* As examples of these laws, the following may be noted: The law giving to the Crown all treasure or valuable ornaments of antiquity found in the United Kingdom; the law giving to the Lord Warden (a mere hon-

our discredit it may also be said, that the spirit of intolerance occasionally manifests itself in this particular at the present day, in some of the most enlightened of the American States. We have a recent example of this in the law which has been proposed in Massachusetts and some other States, restricting the hours of labor, and making it imperative that the capitalist shall not require the services of the operative to regulate his machinery more than ten hours per diem. In a country like the United States, where labor is in demand, and the operative is free to exchange his labor wherever, and according to whatever contract he pleases, such a law is a violation of the rights of both laborer and capitalist, and is worthy of a place in the English "Statute of Laborers" of the fourteenth century, which proscribed what the laborer should eat, drink, and wear, the wages he should receive, and the places in which he should labor.

Yet, notwithstanding the freedom and general recognition of the rights of labor which at present so distinguishes the civil and political condition of England and the United States, it must be remembered that it is only within a few

orary office) of the Cinque Ports (five sea-ports on the Southern coast) a right to all articles reclaimed from the sea; and lastly, a law enacted in the time of George III., prohibiting the use of other than metal buttons on garments, and punishing tailors for the infringement by the forfeiture of the price of the garment, and a fine for each button so used. The object of this law was to protect the metallic button-makers of Birmingham, to the detriment of others who might manufacture buttons of wood, cloth, or other substances. We have especially cited these laws, from the fact that each one of them has been recently enforced. The enforcement of the first is a common occurrence; by virtue of the second, Lord Wellington, some years since, claimed and secured the value of a dead whale which was found and towed into the harbor of Dover, by certain fishermen; while the third was successfully taken advantage of by a knavish debtor in one of the London courts against a prosecuting tailor creditor, during the year 1854.

centuries that our ancestors, the working men of England, have emerged from the condition of actual slaves into that of free laborers; it is only a few hundred years ago since the cultivator of the ground, the domestic servant, and sometimes even the artisan, was the absolute property of another man—bought, sold, let, without any will of his own, like an ox or a horse—producing nothing for himself—and transmitting the miseries of his lot to his children. The progress of civilization destroyed this monstrous system, in the same way that at the present day it is destroying it in Russia and other countries where slavery still exists. But it was by a very slow process that the English slave went forward to the complete enjoyment of the legal rights of a free exchanger. The transition exhibits very many years of gross injustice, of bitter suffering, of absurd and ineffectual violations of the natural rights of man; and of struggles between the capitalist and the laborer, for exclusive advantages, perpetuated by ignorant lawgivers, who could not see that the interest of all classes of producers is one and the same. We may not improperly devote a little space to the description of this dark and evil period. We shall see that while such a struggle goes forward—that is, while security of property and freedom of industry are not held as the interchangeable rights of the capitalist and the laborer—there can be little production and less accumulation. Wherever positive slavery exists—wherever the laborers are utterly deprived of their property in their labor, and are compelled to dispose of it without retaining any part of the character of voluntary exchangers—there are found idleness, ignorance, and unskillfulness; industry is enfeebled—the oppressor and the oppressed are both poor—there is no national accumulation. The existence of slavery among the nations of antiquity was a great impediment to their progress in the arts of life. The community, in such

nations, was divided into a caste of nobles called citizens, and a caste of laborers called slaves. The Romans were rich, in the common sense of the word, because they plundered other nations; but they could not produce largely when the individual spirit to industry was wanting. The industry of the freemen was rapine; the slaves were the producers. No man will work willingly when he is to be utterly deprived of the power of disposing at his own will of the fruits of his labor; no man will work skillfully when the same scanty pittance is doled out to each and all, whatever be the difference in their talents and knowledge. Wherever the freedom of industry is thus violated, property can not be secure. If Rome had encouraged free laborers, instead of breeding menial slaves, it could not have happened that the thieves, who were constantly hovering round the suburbs of the city, like vultures looking out for carrion, should have been so numerous that, during the insurrection of Catiline, they formed a large accession to his army. But Rome had to encounter a worse evil than that of the swarms of highwaymen who were ready to plunder whatever had been produced. Production itself was so feeble when carried on by the labor of slaves, that Columella, a writer on rural affairs, says the crops continued so gradually to fall off that there was a general opinion that the earth was growing old and losing its power of productiveness. Wherever slavery exists at the present day, there we find feeble production and national weakness. Poland, the most prolific corn-country in Europe, is unquestionably the poorest country. Poland has been partitioned, over and over again, by governments that knew her weakness; and she has been said to have fallen "without a crime." That is not correct. Her "crime" was, and is, the slavery of her laborers. There is no powerful class between the noble and the serf or slave; and while this state of things endures,

Poland can never be independent, because she can never be industrious, and therefore never wealthy.

The blighting effects of a system of slavery on the development and progress of a State is also strikingly exhibited in our own country, by contrasting the statistical returns of the free and slave States. Let us take for example the four great States of New York, Ohio, Virginia, and South Carolina, possessing respectively the following territorial areas: New York, 19,000,000 of acres; Ohio, 17,000,000; Virginia, 26,000,000; South Carolina 16,000,000.

The unequal progress of these several States in population during the last 60 years is shown in the following table:

	Pop. in 1790.	Pop. in 1810.	Pop. in 1820.	Pop. in 1830.	Pop. in 1840.	Pop. in 1850.
New York.....	340,000	959,000	1,372,000	1,918,000	2,428,000	3,097,000
Ohio.....	unsettled.	230,000	381,000	937,000	1,519,000	1,980,000
Virginia.....	748,000	974,000	1,065,000	1,211,000	1,239,000	1,421,000
South Carolina.	249,000	415,000	502,000	581,000	594,000	668,000

The average value of land in these States is as follows: in New York, twenty-nine dollars per acre; Ohio, nineteen dollars per acre; Virginia, eight dollars per acre; South Carolina, five dollars per acre. In New York, two thirds of the land is improved; in Ohio, more than one half; in Virginia, two fifths; in South Carolina, one fourth. In New York, 1 native-born person in every 520 of the whole population is a pauper; in Ohio, 1 in 1579; in Virginia, 1 in 326; in South Carolina, 1 in every 600. In New York, the number of inhabitants to the square mile is 67; in Ohio, 49; in Virginia, 23; in South Carolina, 27. In 1850, New York had 1 mile of rail-road for every 24 square miles of territory; Ohio, 1 for every 48; Virginia, 1 for every 127; South Carolina, 1 for every 70. These

comparisons could be extended to various other subjects, with similar results; enough, however, has been deduced to prove the disastrous effect of a system of involuntary labor, considered simply in an economical point of view.

England, as we have said, once groaned under the evils of positive slavery. The Anglo-Saxons had what they called "live money," such as sheep and slaves. To this cause may be doubtless attributed the easy conquest of the country by the Norman invaders, and the oppression that succeeded that conquest. If the people had been free, no king could have swept away the entire population of a hundred thousand souls that dwelt in the country between the Humber and the Tees, and converted a district of sixty miles in length into a dreary desert, which remained for years without houses and without inhabitants. This the Conqueror did. In the reign of Henry II. the slaves of England were exported in large numbers to Ireland. The slaves, or villeins, as is the case in Russia and Poland at the present day, differed in the degree of the oppression which was exercised toward them. Some, called "villeins in gross," were at the absolute disposal of the lord—transferable from one owner to another, like a horse or a cow. Others, called "villeins regardant," were annexed to particular estates, and were called upon to perform whatever agricultural offices the lord should demand from them, not having the power of acquiring any property, and their only privilege being that they were irremovable except with their own consent. These distinctions are not of much consequence, for, by a happy combination of circumstances, the bondmen of every kind, in the course of a century or two after the Conquest, were rapidly passing into the condition of free laborers. But still capital was accumulated so slowly, and labor was so unproductive, that the land did not produce the tenth part of a modern crop; and the

country was constantly exposed to the severest inflictions of famine, whenever a worse than usual harvest occurred.

In the reign of Edward III. the woolen manufacture was introduced into England. It was at first carried on exclusively by foreigners; but as the trade extended, new hands were wanting, and the bondmen of the villages began to run away from their masters, and take refuge in the towns. If the slave could conceal himself successfully from the pursuit of his lord for a year and a day, he was held free forever. The constant attraction of the bondmen to the towns, where they could work for hire, gradually emboldened those who remained as cultivators to assert their own natural rights. The nobility complained that the villeins refused to perform their accustomed services; and that corn remained uncut upon the ground. At length, in 1351, the 25th year of Edward III., the class of free laborers was first recognized by the legislature; and a statute was passed, oppressive indeed, and impolitic, but distinctly acknowledging the right of the laborer to assume the character of a free exchanger. Slavery, in England, was not wholly abolished by statute till the time of Charles II.: it was attempted in vain to be abolished in 1526. As late as the year 1775, the colliers of Scotland were accounted *ascripti glebæ*—that is, as belonging to the estate or colliery where they were born and continued to work. It is not necessary for us further to notice the existence of villeinage or slavery in England. Our business is with the slow progress of the establishment of the rights of free laborers—and this principally to show that, during the long period when a contest was going forward between the capitalists and the laborers, industry was comparatively unproductive. It was not so unproductive, indeed, as during the period of absolute slavery; but as long as any man was compelled to work, or to continue at work, or to receive a fixed price, or

to remain in one place, or to follow one employment, labor could not be held to be free—property could not be held to be secure—capital and labor could not have cordially united for production—accumulation could not have been certain and rapid.

In the year 1349 there was a dreadful pestilence in England, which swept off large numbers of the people. Those of the laborers that remained, following the natural course of the great principle of demand and supply, refused to serve, unless they were paid double the wages which they had received five years before. Then came the "Statute of Laborers," of 1351, to regulate wages; and this statute enacted what should be paid to haymakers, and reapers, and thrashers; to carpenters, and masons, and tilers, and plasterers. No person was to quit his own village, if he could get work at these wages; and laborers and artificers flying from one district to another in consequence of these regulations, were to be imprisoned.

Good laws, it has been said, execute themselves. When legislators make bad laws, there requires a constant increase of vigilance and severity, and constant attempts at reconciling impossibilities, to allow such laws to work at all. In 1360 the Statute of Laborers was confirmed with new penalties, such as burning in the forehead with the letter F those workmen who left their usual abodes. Having controlled the wages of industry, the next step was for these blind lawgivers to determine how the workmen should spend their scanty pittance; and, accordingly, in 1363, a statute was passed to compel workmen and all persons not worth forty shillings to wear the coarsest cloth called russet, and to be served once a day with meat, or fish, and the offal of other victuals. But England was not without imitations of such absurdities in other nations. An ordinance of the King of France, in 1461, determined that

good and fat meat should be sold to the rich, while the poor should be allowed only to buy the lean and stinking.

While the wages of labor were fixed by statute, the price of wheat was constantly undergoing the most extraordinary fluctuations, ranging from two shillings a quarter (eight bushels) to one pound six shillings and eight pence. It was perfectly impossible that any profitable industry could go forward in the face of such unjust and ridiculous laws. In 1376 the Commons complained that masters were *obliged* to give their servants higher wages to prevent their running away; and that the country was covered with *staf-strikers* and *sturdy rogues*, who robbed in every direction. The villages were deserted by the laborers resorting to the towns, where commerce knew how to evade the destroying regulations of the statutes; and to prevent the total decay of agriculture, laborers were not allowed to move from place to place without letters patent; any laborer, not producing such a letter, was to be imprisoned and put in the stocks.



PRISONERS IN THE STOCKS.

If a lad had been brought up to the plow till he was twelve years of age, he was compelled to continue in husbandry all his life; and in 1406 it was enacted that all chil-

dren of parents not possessed of land should be brought up in the occupation of their parents. While the legislature, however, was passing these abominable laws, it was most effectually preparing the means for their extermination. Children were allowed to be sent to school in any part of the kingdom. When the light of education dawned upon the people, they could not long remain in the "darkness visible" that succeeded the night of slavery.

When the industry of the country was nearly annihilated by the laws regulating wages, it was found out that something like a balance should be preserved between wages and prices; and the magistrates were therefore empowered twice a year to make proclamation, according to the price of provisions, how much every workman should receive. The system, however, would not work well. In 1496 a new statute of wages was passed, the preamble of which recited that the former statutes had not been executed, because "the remedy by the said statutes is not very perfect." Then came a new remedy: that is, a new scale of wages for all trades; regulations for the hours of work and of rest; and penalties to prevent labor being transported from one district to another. As a necessary consequence of a fixed scale for wages, came another fixed scale for regulating the prices of provisions; till at last, in the reign of Henry VIII., lawgivers began to open their eyes to the folly of their proceedings, and the preamble of a statute says "that dearth, scarcity, good, cheap, and plenty of cheese, butter, capons, hens, chickens, and other victuals necessary for man's sustenance, happeneth, riseth, and chanceth, of so many and divers occasions, that it is very hard and difficile to put any certain prices to any such things." Yet they went on with new scales, in spite of the hardness of the task; till at last some of the worst of these absurd laws were swept from the statute-book. The just

ices, whose principal occupation was to balance the scale of wages and labor, complained incessantly of the difficulty of the attempt; and the statute of the 5th Elizabeth acknowledged that these old laws "could not be carried into execution without the great grief and burden of the poor laborer and hired man." Still new laws were enacted to prevent the freedom of industry working out plenty for capitalists as well as laborers; and at length, in 1601, a general assessment was directed for the support of the impotent poor, and for setting the unemployed poor to work. The English capitalists at length paid a grievous penalty for their two centuries of oppression; and had to maintain a host of paupers, that had gradually filled the land during these unnatural contests. It would be perhaps incorrect to say, that these contests alone produced the paupers that required this legislative protection in the reign of Elizabeth; but certainly the number of those paupers would have been far less, if the laws of industry had taken their healthy and natural course—if capital and labor had gone hand in hand to produce abundance for all, and fairly to distribute that abundance in the form of profits and wages, justly balanced by the steady operation of demand and supply in a free and extensive market.

The whole of these absurd and iniquitous laws, which had succeeded the more wicked laws of absolute slavery, proceeded from a struggle on the part of the capitalists in land against the growing power and energy of free labor. If the capitalists had rightly understood their interests, they would have seen that the increased production of a thriving and happy peasantry would have amply compensated them for all the increase of wages to which they were compelled to submit; and that at every step by which the condition of their laborers was improved their own condition was also improved. If, then, capital had worked

naturally and honestly for the encouragement of labor, there would have been no lack of laborers; and it would not have been necessary to pass laws to compel artificers, under the penalty of the stocks, to assist in getting in the harvest. (5 Eliz.) If the laborers in agriculture had been adequately paid, they would not have fled to the towns; and if they had not been liable to cruel punishments for the exercise of this their natural right, the country would not have been covered with "valiant rogues and sturdy beggars."

Happy would it have been for the land if the law had left honest industry free, and in the case of dishonesty had applied itself to more effectual work than punishments and terror. That most eminent man, Sir Matthew Hale, said, long ago, what we even now too often forget—"The prevention of poverty, idleness, and a loose and disorderly education, even of poor children, would do more good to England than all the gibbets, and cauterizations, and whipping-posts, and jails in the kingdom." The whole scheme of legislation for the poor, during the reigns of the English monarchs referred to, was to set the poor to work by forced contributions from capital. If the energy of the people had not found out how to set themselves to work in spite of bad laws, England might to this day have remained a nation of slaves and paupers.

But the oppressions and restrictions imposed by the government upon its subjects during these periods have not been wholly without advantages to succeeding generations; and the lessons then purchased by the sad experience of suffering humanity may be studied with profit at the present day. Under the iron rule and exactions of the Tudors and the Stuarts, that spirit of energy and impatience of restraint which has since characterized the Anglo-Saxons and their descendants was nurtured and developed. The historical

lessons of this period may teach the capitalist that involuntary labor is the most unprofitable of all labor, and that the dictates of interest no less than of humanity require that the laborer shall be elevated and protected, and not degraded and persecuted. Governments may also learn that those communities are most prosperous that are governed least; and that by relinquishing the right to interfere with the property and industry of their subjects, they best protect the one, and stimulate and advance the other.

Encouraged by the progress already made, let us hope that the day is not far distant when governments may also, with safety to society, relinquish their rights over the lives as well as the property of their people. When that time shall come, another great step will be taken in social and moral improvement; until at length the wish so quaintly and so hopefully expressed by the poet may find its full and perfect accomplishment:

"I would we were all of one mind, and one mind good;
O then were desolation of jailers and gallowses."

CHAPTER X.

POSSESSIONS OF THE DIFFERENT CLASSES IN ENGLAND.—CONDITION OF COLCHESTER IN 1301.—TOOLS, STOCK IN TRADE, FURNITURE, ETC.—SUPPLY OF FOOD.—COMPARATIVE DURATION OF HUMAN LIFE.—WANT OF FACILITIES FOR COMMERCE.—PLENTY AND CIVILIZATION NOT PRODUCTIVE OF EFFEMINACY.—COLCHESTER IN THE PRESENT DAY.

It will be desirable to exhibit something like an average view of the extent of the possessions of all classes of society, and especially of the middling and laboring classes, in England, at a period when the mutual rights of capitalists and laborers were so little understood as in the fourteenth century. We have shown how, at that time, there was a general round of oppression, resulting from ignorance of the proper interests of the productive classes; and it would be well also to show that during this period of disunion and contest between capital and labor, each plundering the other, and both plundered by arbitrary power, whether of the nobles or the crown, production went on very slowly and imperfectly, and that there was little to plunder and less to exchange. It is difficult to find the materials for such an inquiry. There is no very accurate record of the condition of the various classes of society before the invention of printing; and even after that invention we must be content to form our conclusions from a few scattered facts not recorded for any such purpose as we have in view, but to be gathered incidentally from slight observations which have come down to us. Yet enough remains to enable us to form a picture of tolerable accuracy, and in some points to establish con-

clusions which can not be disputed. It is in the same way that our knowledge of the former state of the physical world must be derived from relics of that former state, to which the inquiries and comparisons of the present times have given an historical value. We know, for instance, that certain animals now peculiar to tropical countries once abounded in northern latitudes, because we occasionally find their bones in quantities which could not have been accumulated unless such animals had been once native to these regions; and the remains of sea-shells upon the tops of hills now under the plow show us that even these heights have been heaved up from the bosom of the ocean. In the same way, although we have no complete picture of the state of property at the period to which we allude, we have evidence enough to describe that state from records which may be applied to this end, although preserved for a very different object.

In the reign of Edward III., in 1344, Colchester, in the county of Essex, was considered the tenth city in England in point of population. It then paid a poll-tax for 2955 lay persons. In 1301, about half a century before, the number of inhabitant housekeepers was 390; and the whole household furniture, utensils, clothes, money, cattle, corn, and every other property found in the town, was valued at £518 16s. 0½d. This valuation took place on occasion of a subsidy or tax to the crown, to carry on a war against France; and the particulars, which are preserved in the Rolls of Parliament, exhibit with great minuteness the classes of persons then inhabiting that town, and the sort of property which each respectively possessed. The trades exercised in Colchester were the following: baker, barber, blacksmith, bowyer, brewer, butcher, carpenter, carter, cobbler, cook, dyer, fisherman, fuller, furrier, girdler, glass-seller, glover, linen-draper, mercer and spice seller, miller, mustard and vinegar seller, old clothes seller, saddler, tailor, tanner, tiler, weaver,

wood-cutter, and wool-comber. If we look at a small town of the present day, where such a variety of occupations are carried on, we shall find that each tradesman has a considerable stock of commodities, abundance of furniture and utensils, clothes in plenty, some plate, books, and many articles of convenience and luxury to which the most wealthy dealers and mechanics of Colchester of the fourteenth century were utter strangers. That many places at that time were much poorer than Colchester there can be no doubt; for here we see the division of labor was pretty extensive, and that is always a proof that production is going forward, however imperfectly. We see, too, that the tradesmen were connected with manufactures in the ordinary use of the term; or there would not have been the dyer, the glover, the linen-draper, the tanner, the weaver, and the wool-comber. There must have been a demand for articles of foreign commerce, too, in this town, or we should not have had the spice-seller. Yet, with all these various occupations, indicating considerable profitable industry when compared with earlier stages in the history of this country, the whole stock of the town was valued at little more than £500. Nor let it be supposed that this smallness of capital can be accounted for by the difference in the standard of money, although that difference is considerable. We may indeed satisfy ourselves of the small extent of the capital of individuals at that day by referring to the inventory of the articles upon which the tax we have mentioned was laid at Colchester.

The whole stock of a carpenter's tools was valued at one shilling. They altogether consisted of two broad-axes, an adze, a square, and a navegor, or spoke-shave. Rough work must the carpenter have been able to perform with these humble instruments; but then let it be remembered that there was little capital to pay him for finer work, and that very little fine work was consequently required. The three

hundred and ninety housekeepers of Colchester then lived in mud huts, with a rough door and no chimney. Harrison, speaking of the manners of a century later than the period we are describing, says, "There were very few chimneys even in capital towns; the fire was laid to the wall, and the smoke issued out at the roof, or door, or window. The houses were wattled, and plastered over with clay, and all the furniture and utensils were of wood. The people slept on straw pallets, with a log of wood for a pillow." When this old historian wrote, he mentions the erection of chimneys as a modern luxury. We had improved little upon our Anglo-Saxon ancestors in the article of chimneys. In their time, Alcuin, an abbot who had ten thousand vassals, writes to the emperor at Rome that he preferred living in his smoky house to visiting the palaces of Italy. This was in the ninth century. Leland, an old English chronicler, in his account of Bolton Castle, which he says was "finiched or Kynge Richard the 2 dyed" (1400), notices the chimneys as follows: "One thyng I mucche notyd in the hawle of Bolton, how chimeneys were conveyed by tunnells made on the syds of the walls betwyxt the lights in the hawle, and by this means, and by no covers, is the smoke of the harthe in the hawle wonder strangely conveyed." Five hundred years had made little difference in the chimneys of Colchester. The nobility had hangings against the walls to keep out the wind, which crept in through the crevices which the builder's bungling art had left; the middle orders had no hangings. Shakspeare alludes to this rough building of houses even in his time:

"Imperial Cæsar, dead and turned to clay,
Might stop a hole to keep the wind away."

So late even as the time of Elizabeth, 1558, we find it stated that apologies were made to visitors if they could

not be accommodated in rooms provided with chimneys, and ladies were frequently sent out to other houses, where they could have the enjoyment of this luxury, for such it undoubtedly was at that period, when only the houses of the rich were provided with it. Even the nobility went without glass to their windows in the fourteenth and fifteenth centuries. "Of old times," says Harrison, "our country houses, instead of glass, did use much lattice, and that made either of wicker or fine rifts of oak, in checker-wise." When glass was introduced, it was for a long time so scarce, that at Alnwick Castle, in 1567, the glass was ordered to be taken out of the windows, and laid up in safety, when the lord was absent.

The mercer's stock-in-trade at Colchester was much upon a level with the carpenter's tools. It was somewhat various, but very limited in quantity. The whole comprised a piece of woolen cloth, some silk and fine linen, flannel, silk purses, gloves, girdles, leather purses, and needlework; and it was altogether valued at three pounds. There appears to have been another dealer in cloth and linen in the town, whose store was equally scanty. We were not much improved in the use of linen a century later. We learn from the Earl of Northumberland's household-book, whose family was large enough to consume one hundred and sixty gallons of mustard during the winter with their salt meat, that only seventy ells of linen were allowed for a year's consumption. In the fourteenth century none but the clergy and nobility wore white linen. As industry increased, and the cleanliness of the middle classes increased with it, the use of white linen became more general; but even at the end of the next century, when printing was invented, the paper-makers had the greatest difficulty in procuring rags for their manufacture; and so careful were the people of every class to preserve their linen, that night-clothes were

never worn. Linen was so dear that Shakspeare makes Falstaff's shirts eight shillings an ell. The more sumptuous articles of a mercer's stock were treasured in rich families from generation to generation; and even the wives of the nobility did not disdain to mention in their wills a particular article of clothing, which they left to the use of a daughter or a friend. The solitary old coat of a baker came into the Colchester valuation; nor is this to be wondered at, when we find that even the soldiers at the battle of Bannockburn, about this time, were described by an old rhymers as "well near all naked."

The household furniture found in use among the families of Colchester consisted, in the more wealthy, of an occasional bed, a brass pot, a brass cup, a gridiron, and a rug or two, and perhaps a towel. Of chairs and tables we hear nothing. We learn from the *Chronicles of Brantôme*, a French historian of these days, that even the nobility sat upon chests in which they kept their clothes and linen. Harrison, whose testimony we have already given to the poverty of these times, affirms, that if a man in seven years after marriage could purchase a flock bed, and a sack of chaff to rest his head upon, he thought himself as well lodged as the lord of the town, "who peradventure lay seldom on a bed entirely of feathers." An old tenure in England, before these times, binds the vassal to find straw even for the king's bed. The beds of flock, the few articles of furniture, the absence of chairs and tables, would have been of less consequence to the comfort and health of the people, if they had been clean; but cleanliness never exists without a certain possession of domestic conveniences. The people of England, in the days of which we are speaking, were not famed for their attention to this particular. Thomas à Becket was reputed extravagantly nice, because he had his parlor strewed every day with clean straw. As

late as the reign of Henry VIII., Erasmus, a celebrated scholar of Holland, who visited England, complains that the nastiness of the people was the cause of the frequent plagues that destroyed them; and he says, "their floors are commonly of clay, strewed with rushes, under which lie unmo-
lest a collection of beer, grease, fragments, bones, spittle, excrements of dogs and cats, and of every thing that is nauseous." The elder Scaliger, another scholar who came to England, abuses the people for giving him no convenience to wash his hands. Glass vessels were scarce, and pottery was almost wholly unknown. The Earl of Northumberland, whom we have mentioned, breakfasted on

trenchers and dined on pewter. While such universal slovenliness prevailed as Erasmus has described, it is not likely that much attention was generally paid to the cultivation of the mind. Before the invention of printing, at the time of the valuation of Colchester, books in manuscript, from their extreme costliness, could be purchased only by



ASTOR LIBRARY, NEW YORK CITY.

princes. The royal library of Paris, in 1378, consisted of nine hundred and nine volumes—an extraordinary number. The same library now comprises upward of six hundred thou-

sand volumes. But it may fairly be assumed that, where one book could be obtained in the fourteenth century by persons of the working classes, four hundred thousand may be as easily obtained now. Even as late as 1539, in England, the Bible, now distributed gratuitously, was placed in churches and often chained to the desk for the use of the common peo-



READING THE BIBLE IN THE SIXTEENTH CENTURY.

ple; and the multitude assembled to hear it read from the few who possessed sufficient education for this purpose.

Here then was a privation which existed five hundred years ago, which debarred our ancestors from more profit and pleasure than the want of beds, and chairs, and linen; and probably, if this privation had continued, and men therefore had not cultivated their understandings, they would not have learned to give any really profitable direction to their labor, and we should still have been as scantily supplied with furniture and clothes as the good people of Colchester of whom we have been speaking.

Let us see what accumulated supply, or capital of food, the inhabitants of England had five centuries ago. Possessions in cattle are the earliest riches of most countries. We have seen that cattle was called "live money;" and it is supposed that the word capital, which means stock generally, was derived from the Latin word "capita," or heads of beasts. The law-term "chattels," is also supposed to come from cattle. These circumstances show that cattle were the chief property of our ancestors. Vast herds of swine constituted the great provision for the support of the people; and these were principally fed upon acorns and beech-mast. In Domesday Book, a valuation of the time of William the Conqueror, it is always mentioned how many hogs each estate can maintain. Hume the historian, in his Essays, alluding to the great herds of swine described by Polybius as existing in Italy and Greece, concludes that the country was thinly peopled and badly cultivated; and there can be no doubt that the same argument may be applied to England in the fourteenth century, although many swine were maintained in forests preserved for fuel. The hogs wandered about the country in a half wild state, destroying, probably, more than they profitably consumed; and they were badly fed, if we may judge from a statute of 1402, which alleges the great decrease of fish in the Thames and other rivers, by the practice of feeding hogs with the

fry caught at the weirs. The hogs' flesh of England was constantly salted for the winter's food. The people had little fodder for cattle in the winter, and therefore they only tasted fresh meat in the summer season. The mustard and vinegar seller formed a business at Colchester, to furnish a relish for the pork. Stocks of salted meat are mentioned in the inventory of many houses there, and live hogs as commonly. But salted flesh is not food to be eaten constantly, and with little vegetable food, without severe injury to the health. In the early part of the reign of Henry VIII., not a cabbage, carrot, turnip, or other edible root, grew in England. Two or three centuries before, certainly, the monasteries had gardens with a variety of vegetables; but nearly all the gardens of the laity were destroyed in the wars between the houses of York and Lancaster. Harrison speaks of wheaten bread as being chiefly used by the gentry for their own tables; and adds that the artificer and laborer are "driven to content themselves with horse-corn, beans, peason, oats, tares, and lentils." There is no doubt that the average duration of human life was at that period not one half as long as at the present day. The constant use of salted meat, with little or no vegetable addition, doubtless contributed to the shortening of life, to say nothing of the large numbers constantly swept away by pestilence and famine. Till lemon-juice was used as a remedy for scurvy among seamen, who also are compelled to eat salted meat without green vegetables, the destruction of life in the navy was something incredible. The English admiral, Hosier, buried his ships' companies twice during a West India voyage in 1726, partly from the unhealthiness of the Spanish coast, but chiefly from the ravages of scurvy. Bad food and want of cleanliness swept away the people of the middle ages, by ravages upon their health that the limited medical skill of those days could never resist. Mat-

thew Paris, a historian of that period, states that there were in his time twenty thousand hospitals for lepers in Europe.

The slow accumulation of capital in the early stages of the civilization of a country is in a great measure caused by the indisposition of the people to unite for a common good in public works, and the inability of governments to carry on these works, when their principal concern is war, foreign or domestic. The foundations of the civilization of England were probably laid by the Roman conquerors, who carried roads through the island, and taught the Britons how to cultivate the soil. Yet improvement went on so slowly, that even a hundred years after the Romans were settled here, the whole country was described as marshy. For centuries after the Romans had constructed the roads, entire districts were separated from one another by the general want of these great means of communication. Bracton, a law-writer of the period we have been so constantly mentioning, holds that, if a man being at Oxford engage to pay money the same day in London, he shall be discharged of his contract, as he undertakes a physical impossibility. (The distance from Oxford to London is fifty-four miles.) We find, as late as the time of Elizabeth, that her majesty would not stay to breakfast at Cambridge because she had to travel twelve miles before she could come to the place, Hinchinbrook, where she desired to sleep. Where there were no roads, there could be few or no markets. An act of parliament of 1272, says that the religious houses should not be compelled to *sell* their provisions—a proof that there were no considerable stores except in the religious houses. The difficulty of navigation was so great, that William Longsword, son of Henry II., returning from France, was during three months tossed upon the sea before he could make a port in England. Looking, therefore, to the want of com-

merce proceeding from the want of communication—looking to the small stock of property accumulated to support labor—and looking, as we have previously done, to the incessant contests between the small capital and the misdirected labor, both feeble, because they worked without skill—we can not be surprised that the poverty of which we have exhibited a faint picture should have endured for several centuries, and that the industry of our English ancestors must have had a long and painful struggle before it could have bequeathed to the people of England such magnificent accumulations as they now enjoy.

The writers who lived at the periods when Europe was slowly emerging from ignorance and poverty, through the first slight union of capital and labor as voluntary exchangers, complain of the increase of comforts as indications of the growing luxury and effeminacy of the people. Harrison says, "In times past men were content to dwell in houses builded of sallow, willow, plum-tree, or elm; so that the



ANCIENT ENGLISH CHAIR.

use of oak was dedicated to churches, religious houses, princes' palaces, noblemen's lodgings, and navigation. But now, these are rejected, and nothing but oak any whit regarded. And yet see the change; for when our houses were builded of willow, then had we oaken men; but now that our houses are made of oak, our men are not only become willow, but many, through Persian delicacy crept in among us, altogether of straw, which is a sore alteration. In those days the courage of the owner was a sufficient defense to keep the house in safety; but now, the

assurance of the timber, double doors, locks, and bolts, must defend the man from robbing. Now have we many chimneys, and our tenderlings complain of rheums, catarrhs, and poses. Then had we none but rere-doses, and our heads did never ache." These complaints go upon the same principle that made it a merit in Epictetus, the Greek philosopher, to have had no door to his hovel. We think he would have been a wiser man if he had contrived to have had a door. A story is told of a Highland chief, Sir Evan Cameron, that himself and a party of his followers being benighted and compelled to sleep in the open air, when his son rolled up a ball of snow and laid his head upon it for a pillow, the rough old man kicked it away, exclaiming, "What, sir! are you turning effeminate?" We doubt whether Sir Evan Cameron and his men were braver than the English officers who fought at Waterloo; and yet many of these marched from the ball-room at Brussels in their holiday attire, and won the battle in silk stockings. It is an old notion that plenty of the necessities and conveniences of life renders a nation feeble. We are told that the Carthaginian soldiers whom Hannibal carried into Italy were suddenly rendered effeminate by the abundance which they found around them at Capua. The Commissariat of modern nations goes upon another principle; and believes that unless the soldier has plenty of food and clothing he will not fight with alacrity and steadiness. The half-starved soldiers of Henry V. won the battle of Agincourt; but it was not because they were half-starved, but because they roused their native courage to cut their way out of the peril by which they were surrounded. When we hear of ancient nations being enervated by abundance, we may be sure that the abundance was almost entirely devoured by a few tyrants, and that the bulk of the people were rendered weak by the destitution which resulted from the unnatural

distribution of riches. We hear of the luxury of the court of Persia—the pomp of the seraglios, and of the palaces—the lights, the music, the dancing, the perfumes, the silks, the gold, and the diamonds. The people are held to be effeminate. The Russians, from the hardy north, can lay the Persian monarchy any day at their feet. Is this national weakness caused by the excess of production among the people, giving them so extravagant a command over the necessities and luxuries of life that they have nothing to do but drink of the full cup of enjoyment? Mr. Fraser, an English traveler, thus describes the appearance of a part of the country which he visited in 1821: “The plain of Yezid-Khaust presented a truly lamentable appearance of the general decline of prosperity in Persia. Ruins of large villages thickly scattered about with the skeleton-like walls of caravansaries and gardens, all telling of better times, stood like *memento moris* (remembrances of death) to kingdoms and governments; and the whole plain was dotted over with small mounds, which indicate the course of cannauts (artificial streams for watering the soil), once the source of riches and fertility, now all choked up and dry; for there is neither man nor cultivation to require their aid.” Was it the luxury of the people which produced this decay—the increase of their means of production—their advancement in skill and capital; or some external cause which repressed production, and destroyed accumulation both of outward wealth and knowledge? “Such is the character of their rulers,” says Mr. Fraser, “that the only measure of their demands is the power to extort on one hand, and the ability to give or restrain on the other.” Where such a system prevails, all accumulated labor is concealed, for it would otherwise be plundered. It does not freely and openly work to encourage new labor. Buckhardt, the traveler of Nubia, saw a farmer who had been plundered

of every thing by the pacha, because it came to the ears of the savage ruler that the unhappy man was in the habit of eating wheaten bread ; and that, he thought, was too great a luxury for a subject. If such oppressions had not long ago been put down in England, she would still have been in the state of Colchester in the fourteenth century. When these iniquities prevailed, and there was neither freedom of industry nor security of property—when capital and labor were not united—when all men consequently worked unprofitably, because they worked without division of labor, accumulation of knowledge, and union of forces—there was universal poverty, because there was feeble production. Slow and painful were the steps which capital and labor had to make before they could emerge, even in part, from this feeble and degraded state. But that they have made a wonderful advance in five hundred years will not be difficult to show. It may assist us in this view if we compare the Colchester of the nineteenth century with the Colchester of the fourteenth, in a few particulars.

In the reign of Edward III. Colchester numbered 359 houses of mud, without chimneys, and with latticed windows. In the reign of Queen Victoria, according to the census of 1851, it has 4145 inhabited houses, containing a population of 19,443 males and females. The houses of the better class, those rented at fifty dollars a year and upward, are commonly built of brick, and slated or tiled ; secured against wind and weather ; with glazed windows and with chimneys, and generally well ventilated. The worst of these houses are supplied, as fixtures, with a great number of conveniences, such as grates, and cupboards, and fastenings. To many of such houses gardens are attached, wherein are raised vegetables and fruits that kings could not command two centuries ago. Houses such as these are composed of several rooms—not of one room only, where the people are

compelled to eat and sleep, and perform every office, perhaps in company with pigs and cattle—but of a kitchen, and often a parlor, and several bedrooms. These rooms are furnished with tables, and chairs, and beds, and cooking utensils. There is ordinarily, too, something for ornament and something for instruction; a piece or two of china, silver spoons, books, and not unfrequently a watch or clock. The useful pottery is abundant, and of really elegant forms and colors; drinking-vessels of glass are universal. The inhabitants are not scantily supplied with clothes. The females are decently dressed, having a constant change of linen, and gowns of various patterns and degrees of fineness. Some, even of the humbler classes, are not thought to exceed the proper appearance of their station if they wear silk. The men have decent working habits, strong shoes and hats, and a respectable suit for Sundays, of cloth often as good as is worn by the highest in the land. Every one is clean; for no house above the few hovels which still deform the country is without soap and bowls for washing, and it is the business of the females to take care that the linen of the family is constantly washed. The children very generally receive instruction in some public establishment; and when the labor of the day is over, the father thinks the time unprofitably spent unless he burns a candle to enable him to read a book or the newspaper. The food which is ordinarily consumed is of the best quality. Wheaten bread is no longer confined to the rich; animal food is not necessarily salted, and salt meat is used principally as a variety; vegetables of many sorts are plenteous in every market, and these by a succession of care are brought to higher perfection than in the countries of more genial climate from which we have imported them; the productions, too, of distant regions, such as spices, and coffee, and tea, and sugar, are universally consumed almost

by the humblest in the land. Fuel, also, of the best quality, is abundant and comparatively cheap.*

If we look at the public conveniences of a modern English town, we shall find the same striking contrast. Water is brought not only into every street, but into every house; the dust and dirt of a family is regularly removed without bustle or unpleasantness; the streets are paved, and lighted at night; roads in the highest state of excellence connect the town with the whole kingdom, and by means of railroads a man can travel several hundred miles in a few hours, and more readily than he could ten miles in the old time; and canal and sea navigation transport the weightiest goods with the greatest facility from each district to the other, and from each town to the other, so that all are enabled to apply their industry to what is most profitable for each and all. Every man, therefore, may satisfy his wants, according to his means, at the least possible expense of the transport of commodities. Every tradesman has a stock ready to meet the demand; and thus the stock of a very moderately wealthy tradesman of the Colchester of the present day is worth more than all the stock of all the different trades that were carried on in the same place in the fourteenth century. The condition of a town like Colchester—a flourishing market-town in an agricultural district—offers a fair point of comparison with a town of the time of Edward III.

* This picture of a flourishing English city, and the condition of its population of 19,000 in the middle of the nineteenth century, when contrasted with any flourishing town or village in the northern United States, will show that, so far as regards educational advantages, practical privileges, and a command over the comforts and luxuries of life, the great mass of the English people are yet far less advanced than their most favored transatlantic brethren.

CHAPTER XI.

CERTAINTY THE STIMULUS TO INDUSTRY.—EFFECTS OF INSECURITY.—INSTANCES OF UNPROFITABLE LABOR.—FORMER NOTIONS OF COMMERCE.—ENGLAND AND HER AMERICAN COLONIES.—NATIONAL AND CLASS PREJUDICES, AND THEIR REMEDY.

Two of the most terrific famines that are recorded in the history of the world occurred in Egypt—a country where there is greater production, with less labor, than is probably exhibited in any other region. The principal laborer in Egypt is the river Nile, whose periodical overflowings impart fertility to the thirsty soil, and produce in a few weeks that abundance which the labor of the husbandman might not hope to command if employed during the whole year. But the Nile is a workman that can not be controlled and directed, even by capital, the great controller and director of all work. The influences of heat, and light, and air, are pretty equal in the same places. Where the climate is most genial, the cultivators have least labor to perform in winning the earth; where it is least genial, the cultivators have most labor. The increased labor balances the small natural productiveness. But the inundation of a great river can not be depended upon like the light and heat of the sun. For two seasons the Nile refused to rise, and labor was not prepared to compensate for this refusal; the ground refused to produce; the people were starved.

We mention these famines of Egypt to show that *certainty* is the most encouraging stimulus to every operation of human industry. We know that production as invariably

follows a right direction of labor, as day succeeds to night. We believe that it will be dark to-night and light again to-morrow, because we know the general laws which govern light and darkness, and because our experience shows us that those laws are constant and uniform. We know that if we plow, and manure, and sow the ground, a crop will come in due time, varying indeed in quantity according to the season, but still so constant upon an average of years, that we are justified in applying large accumulations and considerable labor to the production of this crop. It is this certainty that we have such a command of the productive powers of nature as will abundantly compensate us for the incessant labor of directing those forces, which has during a long course of industry heaped up our manifold accumulations, and which enables production annually to go forward to an extent which even half a century ago would have been thought impossible. The long succession of labor, which has covered this country with wealth, has been applied to the encouragement of the productive forces of nature, and the restraint of the destructive. No one can doubt that, the instant the labor of man ceases to direct those productive natural forces, the destroying forces immediately come into action. Take the most familiar instance—a cottage whose neat thatch was never broken, whose latticed windows were always entire, whose whitewashed walls were ever clean, round whose porch the honeysuckle was trained in regulated luxuriance, whose garden bore nothing but what the owner planted. Remove that owner. Shut up the cottage for a year, and leave the garden to itself. The thatched roof is torn off by the wind and devoured by mice, the windows are driven in by storms, the walls are soaked through with damp and are crumbling to ruin, the honeysuckle obstructs the entrance which it once adorned, the garden is covered

with weeds which years of after-labor will have difficulty to destroy :

" It was a plot
Of garden-ground run wild, its matted weeds
Mark'd with the steps of those whom, as they pass'd,
The gooseberry-trees that shot in long lank slips,
Or currants, hanging from their leafless stems
In scanty strings, had tempted to o'erleap
The broken wall."

Apply this principle upon a large scale. Let the productive energy of a country be suspended through some great cause which prevents its labor continuing in a profitable direction. Let it be overrun by a conqueror, or plundered by domestic tyranny of any kind, so that capital ceases to work with security. The fields suddenly become barren, the towns lose their inhabitants, the roads grow to be impassable, the canals are choked up, the rivers break down their banks, the sea itself swallows up the land. Shakspeare, a great political reasoner as well as a great poet, has described such effects in that part of "Henry V." where the Duke of Burgundy exhorts the rival kings to peace :

" Let it not disgrace me,
If I demand, before this royal view,
What rub, or what impediment, there is,
Why that the naked, poor, and mangled peace,
Dear nurse of arts, plenty, and joyful births,
Should not, in this best garden of the world,
Our fertile France, put up her lovely visage?
Alas! she hath from France too long been chas'd;
And all her husbandry doth lie on heaps,
Corrupting its own fertility.
Her vine, the merry cheerer of the heart,
Unpruned, dies; her hedges even-pleach'd.
Like prisoners wildly overgrown with hair

Put forth disorder'd twigs: her fallow leas,
The darnel, hemlock, and rank fumitory
Doth root upon; while that the coulter rusts,
That should deracinate such savagery:
That even mead, that erst brought sweetly forth
The freckled cowslip, burnet, and green clover,
Wanting the scythe, all uncorrected, rank,
Conceives by idleness; and nothing teems
But hateful docks, rough thistles, keeksies, burs,
Losing both beauty and utility:
And as our vineyards, fallows, meads, and hedges,
Defective in their natures, grow to wildness;
Even so our houses, and ourselves and children,
Have lost, or do not learn, for want of time,
The sciences that should become our country."

It is a familiar English proverb, "that Tenterden steeple was the cause of Goodwin Sands."* The meaning of the saying is, that the capital which was appropriated to keep out the sea from that part of the Kentish coast was diverted to the building of Tenterden steeple; and there being no funds to keep out the sea, it washed over the land. The Goodwin Sands remain to show that man must carry on a perpetual contest to keep in subjection the forces of nature, which, as is said of fire, are good servants, but bad masters. But these examples show, also, that in the social state our control of the physical forces of nature depends upon the right control of our own moral forces. There was injustice, doubtless, in misappropriating the funds which restrained the sea from devouring the land. Till men know that they shall work with justice on every side, they work feebly and unprofitably. England did not begin to accumulate largely and rapidly till the rights both of the poor man and the rich were to a certain degree established—till industry was

* The Goodwin Sands are dangerous shoals upon the coast of Kent, England.

free and property secure. Her great dramatic poet has described this security as the best characteristic of the reign of Queen Elizabeth:

"In her days every man shall eat in safety
Under his own vine what he plants."

Shakspeare derived his image from the Bible, where a state of security is frequently indicated by direct allusion to a man sitting under the shade of his own fig-tree or his own vine. In the days of Elizabeth, as compared with previous eras, there was safety, and a man might

"Sing
The merry songs of peace to all his neighbors."

England has gone on, constantly improving these blessings. But let any circumstances again arise which may be powerful enough to destroy or even molest the freedom of industry and the security of property, and her people would work once more without certainty. The elements of prosperity would not be constant and uniform. They would work with the apprehension that some hurricane of tyranny, no matter from what power, would arise, which would sweep away accumulation. When that hurricane did not rise, they might have comparative abundance, like the people of Egypt during the inundation of the Nile. They would then have an inundation of tranquillity. But if the tranquillity were not present—if lawless violence stood in the place of justice and security—the people of England would be like the people of Egypt when the Nile did not overflow. They would suffer the extremity of misery; and that possible extremity would produce an average misery, even if tranquillity did return, because security had not returned. They would, if this state of things long abided, by degrees go back to the condition of Colchester in the fourteenth

century, and thence to the universal marsh of two thousand years ago. The place where London stands would be, as it once was, a wilderness for howling wolves. The few that produced would again produce laboriously and painfully, without skill and without division of labor, because without accumulation; and it would probably take another thousand years, if men again saw the absolute need of security, to re-create what security has accumulated for the present use.

From the moment that the industry of England began to work with security, and capital and labor applied themselves in union—perhaps not a perfect union, but still in union—to the great business of production, they worked with less and less expenditure of unprofitable labor. They continued to labor more and more profitably, as they labored with knowledge. The labor of all rude nations, and of all uncultivated individuals, is labor with ignorance. Peter the wild boy, whom we have already mentioned, could never be made to perceive the right direction of labor, because he could not trace it through its circuitous courses for the production of utility. He would work under control, but, if left to himself, he would not work profitably. Having been trusted to fill a cart with manure, he labored with diligence till the work was accomplished; but no one being at hand to direct him, he set to work as diligently to unload the cart again. He thought, as too many think even now, that the good was in the labor, and not in the results of the labor. The same ignorance exhibits itself in the unprofitable labor and unprofitable application of capital, even of persons far removed beyond the half-idiocy of Peter the wild boy. In the thirteenth century many of the provinces of France were overrun with rats, and the people, instead of vigorously hunting the rats, were persuaded to cry on a process against them in the ecclesiastic courts;

and there, after the cause of the injured people and the injuring rats was solemnly debated, the rats were declared cursed and excommunicated if they did not retire in six days. The historian does not add that the rats obeyed the injunction; and doubtless the farmers were less prepared to resort to the profitable labor of chasing them to death when they had paid the ecclesiastics for the unprofitable labor of their excommunication. There is a curious instance of unprofitable labor given in a book on the Coal Trade of Scotland, written as recently as 1812. The people of Edinburgh, had a passion for buying their coals in immense lumps, and to gratify this passion, the greatest care was taken not to break the coal in any of the operations of conveying them from the pit to the cellar of the consumer. A wall of coals was first built within the pit, another wall under the pit's mouth, another wall when they were raised from the pit, another wall in the wagon which conveyed them to the port where they were shipped, another wall in the hold of the ship, another wall in the cart which conveyed them to the consumer, and another wall in the consumer's cellar; and the result of these seven different buildings-up and takings-down was, that after the consumer had paid thirty per cent. more for these square masses of coal than for coal shoveled together in large and small pieces, his servant had daily to break the large coals to bits to enable him to make any use of them. It seems extraordinary that such waste of labor and capital should have existed among a highly acute and refined community within the last forty years. They, perhaps, thought they were making good for trade, and therefore submitted to the evil; while the Glasgow people, on the contrary, by saving thirty per cent. in their coals, had that thirty per cent. to bestow upon new enterprises of industry, and for new encouragement to labor.

The unprofitable applications of capital and labor which

the early history of the civilization of every people has to record, and which, among many, have subsisted even while they held themselves at the height of refinement, have been fostered by the ignorance of the great, and even of the learned, as to the causes which, advancing production or retarding it, advanced or retarded their own interests, and the interests of all the community. Princes and statesmen, prelates and philosophers, were equally ignorant of

"What makes a nation happy, and keeps it so;
What ruins kingdoms, and lays cities flat."

It was enough for them to consume; they thought it beneath them to observe even, much less to assist in, the direction of production. This was ignorance as gross as that of Peter the wild boy, or the excommunication of rats. It has always been the fashion of ignorant greatness to despise the mechanical arts. The pride of the Chinese mandarins was to let their nails grow as long as their fingers, to show that they never worked. Even European nobles once sought the same absurd distinction. In France, under the old monarchy, no descendant of a nobleman could embark in trade without the highest disgrace; and the principle was so generally recognized as just, that a French writer, even as recently as 1758, reproaches the sons of the English nobility for the contrary practice, and asks, with an air of triumph, how can a man be fit to serve his country in parliament after having meddled with such paltry concerns as those of commerce?*

Montesquieu, a writer in most re-

* It is a striking illustration of the change which a single century has effected in the minds and opinions of men, to find John Bright, in 1855, in the British House of Commons, fearlessly denouncing the English aristocracy and nobility, as of all others the most incapable of being intrusted with the duties and responsibilities of government, "*no portion of which can they manage with even common ability*;" and demanding, in company

spects of enlarged views, holds that it is beneath the dignity of governments to interfere with such trumpery things as the regulation of weights and measures. Society might have well spared the interference of governments with weights and measures if they had been content to leave all commerce equally free. But, in truth, the regulation of weights and measures is almost a solitary exception to the great principle which governments ought to practice, of not interfering, or interfering little, with commerce.

Louis XIV. did not waste more capital and labor by his ruinous wars, and by his covering France with fortifications and palaces, than by the perpetual interferences of himself and his predecessors with the freedom of trade, which compelled capital and labor to work unprofitably. Had it not been also for the absurd and tyrannical laws regulating manufactures and commerce, which the British parliament so constantly imposed upon its American colonies, it is not improbable that the revolution which deprived England of its finest possessions, might have been averted, or at least postponed. Some of the most curious examples of laws restricting the rights of labor and of commerce, enacted in modern times, are to be found in the history of British legislation respecting America. As early as 1699, the colonies were prohibited from exporting wool yarn, or woollen fabrics, or from carrying them coastwise from one colony to another. Wool was at that time the great staple of England, and its growers and manufacturers envied the colonies the possession of a flock of sheep, a spindle, or a loom. Complaints were also made by the London hatters

with numerous other members of both Houses of Parliament, and the most influential of the citizens of London, that "*the right men*," those who were experienced from their practical management of commercial and mercantile affairs, should be elevated to stations of official trust and honor.

that great quantities of hats were made in America and shipped to other countries to *their* injury, and parliament struck at the root of the evil by an act which prevented the exportation of hats from the colonies to foreign countries, and from being carried from one plantation to another. They prohibited hats from being laden upon a horse, cart, or other carriage in America, with intent to be exported to any other plantation, or to *any place whatever*; and no hatter in the colonies was allowed to employ more than *two* apprentices, or to make hats at all, unless he had served an apprenticeship of seven years to the trade. Thus the fabrics of Connecticut might not seek a market in Massachusetts, or be sold in New York. An English sailor, or merchant, arriving at the port of Boston, was also prohibited from purchasing woolens of the value of more than forty shillings.

In 1750, parliament passed a law prohibiting the *erection* or *contrivance* of any mill, or engine for slitting or rolling iron, or any plating forge to work with a tilt-hammer, or any furnace for making steel in the colonies, *under the penalty of two hundred pounds*. And to secure the enforcement of the law, they declared all such mills to be *common nuisances*, and the governors of the colonies were directed to abate them, or forfeit *five hundred pounds* to the crown.

Enactments like these seem so strange at the present day, so contrary to all natural principles of right and justice, so repugnant to common sense, that men are almost incredulous of their former actual existence. It may be said that these laws, enacted by the English Parliament, were intended not to regulate American industry, but to prohibit it entirely, and the intolerable injustice of this course of procedure was not only not perceived, but even defended by the ablest and most renowned of British statesmen. "The interests of the landed proprietors," says a writer on the subject, "with the monopolies of commerce and manu-

factures, jointly fostered by artificial legislation, had so corrupted the public judgment, that there was not even secret compunction."

The injurious effect of these laws was not wholly confined to the colonies, but became equally so to England, from their effects on the connection between America and the mother-country. Trade, instead of being encouraged, was interrupted; and commerce, which should have been a bond of peace between the two nations, was made a source of constant hostility, and an instrument for distributing the germs of disaffection, which afterward ripened into civil war.

In every age and country the naturally slow progress of profitable industry has been rendered more slow by the perpetual inclination of those in authority to divert industry from its natural and profitable channels. It was, therefore, wisely said by a committee of merchants to Colbert, the prime minister of France in the reign of Louis XIV., when he asked them what measures government could adopt to promote the interests of commerce—"Let us alone; permit us quietly to manage our own business." It is undeniable that the interests of all are best promoted when each is left free to attend to his own interests, under the necessary social restraints which prevent him doing a positive injury to his neighbor. It is thus that agriculture and manufactures are essentially allied in their interests; that unrestrained commerce is equally essential to the real and permanent interests of agriculture and manufactures; that capital and labor are equally united in their most essential interest, which is, that there should be cheap production. While these principles are not understood at all, or while they are imperfectly understood—as they are still by many classes and individuals—there must be a vast deal of bickering and heart-burning between individuals who ought

to be united, and classes who ought to be united, and nations who ought to be united; and so long as it is not felt by all, that their natural rights are understood and will be respected, there is a feeling of insecurity which more or less affects the prosperity of all. The only remedy for these evils is the extension of knowledge. Louis XV. proclaimed to the French that the English were their "*veritables ennemis*," their true enemies. When knowledge is triumphant it will be found that there are no "*veritables ennemis*" either among nations, or classes, or individuals: The prejudices by which nations, classes, and individuals are led to believe that the interest of one is opposed to the interest of another, are, nine times out of ten, as utterly ridiculous as the reason which a Frenchman once gave for hating the English—which was, "that they poured melted butter on their roast veal;" and this was not more ridiculous than the old denunciation of the English against the French, that "they ate frogs, and wore wooden shoes." When the world is disabused of the belief that the wealth of one nation, class, or individual must be created by the loss of another's wealth, then, and then only, will all men steadily and harmoniously apply to produce and to enjoy—to acquire prosperity and happiness—lifting themselves to the possession of good.

"By Reason's light, on Resolution's wing."

CHAPTER XII.

EMPLOYMENT OF MACHINERY IN MANUFACTURES AND AGRICULTURE.—ERRONEOUS NOTIONS FORMERLY PREVALENT ON THIS SUBJECT.—ITS ADVANTAGES TO THE LABORER.—SPADE HUSBANDRY.—THE PRINCIPLE OF MACHINERY.—MACHINES AND TOOLS.—CHANGE IN THE CONDITION OF ENGLAND CONSEQUENT ON THE INTRODUCTION OF MACHINERY.—MODERN NEW ZEALANDERS AND ANCIENT GREEKS.—HAND-MILLS AND WATER-MILLS.

ONE of the most striking effects of the want of knowledge producing disunions among mankind that are injurious to the interests of each and all, is the belief which still exists among many well-meaning but unreflecting persons, that the powers and arrangements which capital has created and devised for the advancement of production are injurious to the great body of working-men in their character of producers. The great forces by which capital and labor now work—forces which are gathering strength every day—are accumulation of skill and division of employments. It will be for us to show that the applications of science to the manufacturing arts have the effect of insuring cheap production and increased employment. These applications of science are principally displayed in the use of MACHINERY; and we shall endeavor to prove that, although individual labor may be partially displaced or unsettled for a time, by the use of this cheaper and better power than unassisted manual labor, all are great gainers by the general use of that power. Through that power all principally possess, however poor they may be, many of the comforts which make the difference between man in a civilized and

man in a savage state; and further, that in consequence of machinery having rendered productions of all sorts cheaper, and therefore caused them to be more universally purchased, it has really increased the demand for that manual labor, which it appears to some, reasoning only from a few instances, it has a tendency to diminish.

In the year 1827, a Committee of the English House of Commons was appointed to examine into the subject of emigration. The first person examined before that Committee was Joseph Foster, a working weaver of Glasgow. He told the Committee that he and many others, who had formed themselves into a society, were in great distress; that numbers of them worked at the *hand-loom* from eighteen to nineteen hours a day, and that their earnings, at the utmost, did not amount to more than seven shillings a week, and that sometimes they were as low as four shillings. That twenty years before that time they could readily earn a pound a week by the same industry; and that as *power-loom* weaving had increased, the distress of the hand-weavers also had increased in the same proportion. The Committee then put to Joseph Foster the following questions, and received the following answers:

Q. "Are the Committee to understand that you attribute the insufficiency of your remuneration for your labor to the introduction of machinery?"

A. "Yes.

Q. "Do you consider, therefore, that the introduction of machinery is objectionable?"

A. "We do not. The weavers in general, of Glasgow and its vicinity, do not consider that machinery can or ought to be stopped, or put down. They know perfectly well that machinery must go on, that it will go on, and that it is impossible to stop it. They are aware that every implement of agriculture or manufacture is a portion of ma-

chinery, and, indeed, every thing that goes beyond the teeth and nails (if I may use the expression) is a machine. I am authorized, by a majority of our society, to say that I speak their minds, as well as my own, in stating this."

It is worthy of note how the common sense of this working-man, a quarter of a century ago, saw clearly the great principle which overthrows, in the outset, all unreasoning hostility to machinery. Let us follow out his principle.

Among the many accounts which the newspapers of England, in 1830, gave of the destruction of machinery by agricultural laborers, it was stated that in one district a band of mistaken and unfortunate men destroyed all the machinery of many farms, *down even to the common drills*. The men conducted themselves, says the newspaper, with civility; and such was their consideration, that they moved the machines out of the farm-yards, to prevent injury arising to the cattle from the nails and splinters that flew about while the machinery was being destroyed. *They could not make up their minds* as to the propriety of destroying a horse-churn, and therefore that machine was passed over.

A quarter of a century has made a remarkable difference in the feelings of laborers, not only in England, but in all other countries, even among the least informed with regard to machinery. The majority of the people now know, as the weavers of Glasgow knew in 1827, that "machinery must go on, that it will go on, and that it is impossible to stop it." It is unnecessary at the present day to adduce any argument to prove or sustain this position. Common sense teaches it, and in the United States especially, where the fact is almost universally acknowledged and acted upon, the great majority of laborers rejoice in every new mechanical application and improvement, as an additional instrument for the elevation of labor, and the income of wealth. It is sufficient briefly to show, that if the English laborers

had been successful in their career, had broken all those ingenious implements which have aided in rendering British agriculture the most perfect in the world, they would not have advanced a single step in obtaining more employment, or being better paid.

* We will suppose, then, that the farmer has yielded to this violence; that the violence has had the effect which it was meant to have upon him; and that he takes on all the hands which were out of employ to thrash and winnow, to cut chaff, to plant with the hand instead of with a drill, to do all the work, in fact, by the dearest mode instead of the cheapest. But he employs *just as many people as are absolutely necessary*, and no more, for getting his corn ready for market, and for preparing, in a slovenly way, for the seed-time. In a month or two the victorious destroyers find that not a single hand the more of them is really employed. And why not? There are no drainings going forward, the fences and ditches are neglected, the dung-heap is not turned over, the marl is not fetched from the pit; in fact, all those labors are neglected which belong to a state of agricultural industry which is brought to perfection. *The farmer has no funds to employ in such labors*; he is paying a great deal more than he paid before for the same, or a less amount of work, because his laborers choose to do certain labors with rude tools instead of perfect ones.

We will imagine that this state of things continues till the next spring. All this while the price of grain has been rising. Many farmers have ceased to employ capital at all upon the land. The neat inventions, which enabled them to make a living out of their business, being destroyed, they have abandoned the business altogether. A day's work will now no longer purchase as much bread as before. The horse, it might be probably found out, was as great an enemy as the drill-plow; for, as a horse will do the field-work of

six men, there must be six men employed, without doubt, instead of one horse. But how would the fact turn out? If the farmer still went on, in spite of all these losses and crosses, he might employ men in the place of horses, but not a single man more than the number that would work at the price of the keep of one horse. To do the work of each horse turned adrift, he would require six men; but he would only have about a shilling a day to divide between these six—the amount which the horse consumed.

As the year advanced, and the harvest approached, it would be discovered that not one tenth of the land was sown; for although the plows were gone, because the horses were turned off, and there was plenty of *labor* for those who chose to labor for its own sake, or at the price of horse-labor, this amazing employment for human hands, somehow or other, would not quite answer the purpose. It has been calculated that the power of horses, oxen, etc., employed in husbandry in Great Britain is ten times the amount of human power. If the human power insisted upon doing all the work with the worst tools, the certainty is that not even one tenth of the land could be cultivated. Where, then, would all this madness end? In the starvation of the laborers themselves, even if they were allowed to eat up all they had produced by such imperfect means. They would be just in the condition of any other barbarous people, that were ignorant of the inventions that constitute the power of civilization. They would eat up the little corn which they raised themselves, and have nothing to give in exchange for clothes, and coals, and candles, and soap, and tea, and sugar, and all the many comforts which those who are even the worst off are not wholly deprived of.

All this may appear as an extreme statement; and certainly we believe that no such evils could have happened; for if the laws had been passive, the most ignorant of the

laborers themselves would, if they had proceeded to carry their own principle much further than they had done, see in their very excesses the real character of the folly and wickedness to which it had led, and would lead them. Why should the laborers of England not have destroyed the harrows as well as the drills? Why leave a machine which separates the clods of the earth, and break one which puts seed into it? Why deliberate about a horse-churn, when they were resolved against a winnowing-machine? The truth is, these poor men perceived, even in the midst of their excesses, the gross deception of the reasons which induced them to commit them. Their motive was a natural, and, if lawfully expressed, a proper impatience, under a condition which had certainly many hardships, and those hardships in great part produced by the want of profitable labor. But in imputing those hardships to machinery, they were at once embarrassed when they came to draw distinctions between one sort of machine and another. This embarrassment decidedly shows that there were fearful mistakes at the bottom of their furious hostility to machinery.

It has been said, by persons whose opinions are worthy attention, that spade-husbandry is, in some cases, better than plow-husbandry; that is, that the earth, under particular circumstances of soil and situation, may be more fitly prepared for the influences of the atmosphere by digging than by plowing. It is not our business to enter into a consideration of this question. The growth of corn is a manufacture, in which man employs the chemical properties of the soil and of the air in conjunction with his own labor, aided by certain tools or machines, for the production of a crop; and that power, whether of chemistry or machinery—whether of the salt, or the lime, or the dung, or the guano, which he puts upon the earth, or the spade or

the plow which he puts into it—that power which does the work easiest is necessarily the best, *because it diminishes the cost of production*. If the plow does not do the work as well as the spade, it is a less perfect machine; but the less perfect machine may be preferred to the more perfect, because, taking other conditions into consideration, it is a cheaper machine. If the spade, applied in a peculiar manner by the strength and judgment of the man using it, more completely turns up the soil, breaks the clods, and removes the weeds than the plow, which receives one uniform direction from man with the assistance of other animal power, then the spade is a more perfect machine in its combination with human labor than the plow is, worked with a lesser degree of the same combination. But still it may be a machine which can not be used with advantage to the producer, and is therefore not desirable for the consumer. All such questions must be determined by the cost of production; and that cost in agriculture is made up of the rent of land, the profit of capital, and the wages of labor—or the portions of the produce belonging to the landlord, the farmer, and the laborer. Where rent is high, as in the immediate neighborhood of large towns, it is important to have the labor performed as carefully as possible, and the succession of crops stimulated to the utmost extent by manure and labor. It is economy to turn the soil to the greatest account, and the land is cultivated as a garden. Where rent is low, it is important to have the labor performed upon other principles, because one acre cultivated by hand may cost more than two cultivated by the plow; and though it may be the truest policy to carry the productiveness of the earth as far as possible, field cultivation and garden cultivation must have essential differences. In one case, the machine called a spade is used; in the other, the machine called a plow is employed.

The use of the one or the other belongs to practical agriculture, and is a question only of relative cost.

And this brings us to the great *principle* of all machinery. A tool of the simplest construction is a machine; a machine of the most curious construction is only a complicated tool. There are many cases in the arts, and there may be cases in agriculture, in which the human arm and hand, with or without a tool, may do work that no machine can so well perform. There are processes in polishing, and there is a process in copperplate printing, in which no substance has been found to stand in the place of the human hand. And, if therefore the man with a spade alone does a certain agricultural work more completely than a man guiding a plow, and a team of horses dragging it (which we do not affirm or deny), the only reason for this is, that the man with the spade is a better machine than the man with the plow and the horses. The most stupid man that ever existed is, beyond all comparison, a machine more cunningly made by the hands of his Creator, more perfect in all his several parts, and with all his parts more exquisitely adapted to the regulated movement of the whole body, less liable to accidents, and less injured by wear and tear, than the most beautiful machine that ever was, or ever will be, invented. There is no possibility of supplying in many cases a substitute for the simplest movements of a man's body, by the most complicated movements of the most ingenious machinery. The laws of mechanism are the same whether applied to a man, or to a lever, or a wheel; but the man has more pliability than any combination of wheels and levers. When a porter carries a burden, the attitude of the body must accomodate itself to the position of the common center of gravity of himself and his load.

To enable us to walk steadily, it is necessary that a per-

pendicular line, let fall from the center of gravity, should fall within the base of support—as it does when we walk in the ordinary manner unincumbered with any burden. But if a porter carrying a heavy burden should attempt to stand in a perfectly erect position, as in Fig. A, the line let fall from the common center of gravity of the man and the load, would fall without the base of his support—that is, beyond his heels—and as a consequence he would fall backward. In order to prevent this, the porter instinctively bends his body forward as in Fig. B, and thereby maintains his stability—since in this position the line let fall from the center of gravity of the man and the load falls within the base of his support, that is, between his feet.



What is called the lay figure of the painter—a wooden image with many joints—may be bent here and there; but the artist who wanted to draw a porter with a load, could not put a hundred weight upon the back of his image and keep it upon its legs. The natural machinery by which a man even lifts his hand to his head, is at once so complex and so simple, so apparently easy and yet so entirely dependent upon the right adjustment of a great many contrary forces, that no automaton, or machine imitating the actions of man, could ever be made to effect this seemingly

simple motion, without showing that the contrivance was imperfect—that it was a mere imitation, and a very clumsy one. What an easy thing it appears to be for a farming man to thrash his corn with a flail; and yet what an expensive arrangement of wheels is necessary to produce the same effects with a thrashing machine! The truth is, that the man's arm and the flail form a much more curious machine than the other machine of wheels, which does the same work; and the real question as regards the value of the two machines is, which machine in the greater degree lessens the cost of production.

We state this principle broadly, in our examination into the value of machinery in diminishing the cost of production; that the value of a machine depends upon the combined accuracy and economy with which it will complete a desired result—the cost of the machine in the first instance, and the cost of maintaining it in good order, being taken into consideration. A steam-engine is well adapted to pump water from a well or cistern; yet no sane man would adopt it for the purpose of supplying in this way the wants of a small family. The importance of this principle is often overlooked in the details of practical life, by thoughtful and ingenious men. The patent office at Washington is crowded with models of inventions, exhibiting a wonderful amount of skill and design, and not one in ten of which have proved of any great value to the inventors or the public. The reason of this is simply that they were more expensive and complicated, or effected no better purpose than machines which preceded them which discharged the same work—or it may be they were more expensive in their working than unaided hand labor. We have a particular illustration of this in an invention made some years since, for folding newspapers, as they came from the press, into a form suitable for the carriers or for the mails. The mechanism was

perfectly adapted to perform the work, which it did with almost life-like movement; yet the demand for such mechanical labor was so limited, the machine so expensive, complicated, and so liable to disarrangement, that it was never permanently substituted for manual labor, and therefore remained an expensive toy. A machine is not perfect because it is made of wheels or cylinders, employs the power of the screw or the lever, is driven by wind, or water, or steam; but because it best assists the labor of man, by economizing time or power, or by calling into action some power which man does not possess in himself. If we could imagine a man entirely dispossessed of the power of rendering the forces of nature subservient to himself, we should see the feeblest of animal beings. Man has no tools which are a part of himself to build houses like the beaver, or cells like the bee. He has not even learned from nature to build instinctively, by certain and unchangeable rules, but varies continually the form of his structural habitations. Indeed, the origin of all our architectural rules and styles, have sprung as it were by chance, from the rudest and most imperfect models. Whatever chance structures the early and uncivilized inhabitants of any country have fashioned from the materials afforded them as a shelter and protection from the weather, the same structures, with all their prominent features, have been perpetuated and reproduced by their more enlightened and opulent posterity. Thus we find the characteristics of the cavern and the mound in the Egyptian style of architecture, and the form and structure of the tent in the peaked roofs and conical buildings of the Chinese. The much admired architecture of the Greeks and the structure of the Parthenon perpetuates the form of the original rude cabin, while the descendants of the Teutonic races still reproduce in the arches of their Gothic cathedrals the leafy bowers and forest lodges of their ancestors.

Man, however, does not need to be instructed instinctively like the lower animals. His power is in his mind, and that rightly cultivated and developed teaches him to use the materials and forces of nature to construct edifices, arch tunnels, and build bridges, as surely and as effectively as instinct teaches the beaver to construct dams and embankments, or the bee to fashion combs and hexagonal cells. Through this power man has been enabled to subject the whole physical world to his dominion, and through it alone he obtains the prerogative of being able to progress. Animal instinct of to-day is no better or more improved than it was a thousand years ago; the swallow of to-day labors as unremittingly, employs as many materials in the construction of her nest, as did the swallow of three thousand years ago, and after all this experience, the structure and design of the nest last constructed will have no improvement upon the first. If man, however, were to rebuild at the present day the great pyramid of Egypt, or the temple of Solomon, he would construct better edifices than the originals with half the time and a tenth of the expense. Herodotus informs us that one hundred thousand men were constantly employed for twenty years in the building of the pyramid of Cheops: but all the materials which compose it could now be raised from the ground to their present position, by the combustion of less than five hundred tons of coal. "The instincts of man are faint and feeble, while to reason and faith the vistas are boundless." Wisdom is better than strength, "and the more that wisdom spreads the more human strength is saved and the more is comfort enhanced."

To act upon material objects, man arms his weakness with tools and machines. As we have before said, tools and machines are, in principle, the same. When we strike a nail upon the head with a hammer, we avail ourselves of

a power which we find in nature—the effect produced by the concussion of two bodies; when we employ a water-wheel to beat out a mass of iron with a still larger hammer, we still avail ourselves of the same power. There is no difference in the nature of the instruments, although we call one a tool, and the other a machine. “A tool,” says Mr. Babbage, “is usually more simple than a machine; it is generally used with the hand, while a machine is frequently moved by animal or steam-power. The simpler machines are often merely one or more tools placed in a frame, and acted upon by a moving power.” But neither the tool nor the machine has any force of itself. In one case the force is in the arm, in the other in the water, the steam, or the animal that turns the wheel. The distinctions which have been taken between a tool and a machine are really so trivial, and the line of separation between one and the other is so slight, that we can only speak of both as common instruments for adding to the efficiency of labor. The simplest application of a principle of mechanics to an every-day hand-tool may convert it into what is called a machine. Take a three-pronged fork—one of the universal tools; fasten a rope to the end of the handle; put a log under the fork as a fulcrum; and we have a lever, when pulled down by the rope, which will grub up a strongly-rooted large shrub in a few minutes. The laborer has called in a powerful ally. The tool has become a machine. Both machines and tools, however, are intermediate instruments to transmit, to modify, or to apply power; and with the exception of the power consumed in wearing away the rubbing parts—that is, in producing friction—and the small portions transmitted to the air, the amount of power transmitted is just equal to that received.

The chief difference between man in a rude, and man in a civilized state of society is, that the one wastes his force,

whether natural or acquired—the other economizes, that is, saves it. The man in a rude state has very rude instruments; he, therefore, wastes his force: the man in a civilized state has very perfect ones; he, therefore, economizes it. Should we not laugh at the gardener who went to hoe his potatoes with a stick having a short crook at the end? It would be a tool, we should say, fit only for children to use. Yet such a tool was doubtless employed by some very ancient nations; for there is an old medal of Syracuse which represents this very tool. The common hoe of the gardener is a much more perfect tool, because it saves labor. Could we have any doubt of the madness of the man who would propose that all iron hoes should be abolished, to furnish more extensive employment to laborers who should be provided only with a crooked stick cut out of a hedge? The truth is, if the working men of the United States had no better tools than crooked sticks, they would be in a state of actual starvation. One of the chiefs of New Zealand, before that country had been colonized, told a missionary that his wooden spades were all broken, and he had not an ax to make any more; his canoes were all broken and he had not a nail or a gimlet to mend them with; his potato-grounds were uncultivated, and he had not a hoe to break them up with; and that, *for want of cultivation*, he and his people would have nothing to eat. This shows the state of a people without tools. The man had seen tools, and knew their value.

About three or four hundred years ago, from the times of King Henry IV. to those of King Henry VI., and, indeed, long before these reigns, there were often, as we have already mentioned, grievous famines in England, because the land was very wretchedly cultivated. Men, women, and children perished of actual hunger by thousands; and those who survived kept themselves alive by eating the bark of trees, acorns, and pig-nuts. There were no machines

then; but the condition of the laborers was so bad, that they could not be kept to work upon the land without those very severe and tyrannical laws noticed in Chapter IX., which actually forbade them to leave the station in which they were born as laborers, for any hope of bettering their condition in the towns. There were not laborers enough to till the ground, for they worked without any skill, with weak plows and awkward hoes. They were just as badly off as some of the people of Portugal and Spain, who are miserably poor, *because* they have bad machines; or, as the Chinese laborers who have scarcely any machines, and are the poorest in the world.

Indeed, it would be difficult to find a more striking illustration of the miserable condition of a populous community laboring without machinery, than is exhibited to us in the case of the Chinese. The industry and patient labor of these people are proverbial, and far superior to that of the white races of Europe and America, and yet the great majority of the three hundred and sixty millions inhabiting the vast empire of China, are obliged to toil during the whole period of their lives, for the scantiest food and the simplest raiment. Gutzlaff, the missionary, tells us, that millions upon millions of Chinese are ready to work, simply for their bare subsistence upon rice. In China, therefore, there is not, and can not be accumulation; no values devoted to the establishment of schools, or for the endowment of hospitals for the sick or infirm; the poor are left to starve; the sick have no efficient remedies; infanticide is legalized. The poor, furthermore, have not only the misfortune to be poor, but they have that additional burden, which M. Say describes as a greater misfortune than mere poverty, "they are surrounded by those only who are as poor as themselves." The American farmer, on the contrary, with a less amount of labor, and with no superior

advantage either of soil or climate, is enabled not only to consume more and better food than the Chinese, and wear better and more costly clothing, but also to accumulate. The difference in result which the two have attained to, is to be attributed solely to the fact, that the one depends mainly upon his hands, or the rudest and most imperfect implements, the experience of former generations and of cotemporaries being in a great measure denied to him, from the want of books or mediums of intelligence, while the other has called to his aid the most perfect machinery, and the results of accumulated experimentation and practice.

In the reigns of Henry IV. and V. of England, there was plenty of labor to be performed, but the tools were so bad, and the want of agricultural knowledge so universal, that the land was never half cultivated, and therefore all classes were poorly off. They had little corn to exchange for manufactures, and in consequence the laborer was badly clothed, badly lodged, and had a very indifferent share of the scanty crop which he raised. The condition of the laborer would have proceeded from bad to worse, had agricultural improvement not gone forward to improve the general condition of all classes. Commons were inclosed; arable land was laid down to pasture; sheep were kept upon grass-land where wretched crops had before been growing. This was superseding labor to a great extent, and much clamor was raised about this plan, and probably a large amount of real distress was produced. But mark the consequence. Although the money wages of labor were lowered, because there were more laborers in the market, the real amount of wages was higher, for better food was created by pasturage at a cheaper rate. The laborer then got meat who had never tasted it before; and when the use of animal food became general, there were

cattle and corn enough to be exchanged for manufactured goods, and the laborer got a coat and a pair of shoes, who had formerly gone half naked. Step by step have the people of England been advancing in the same direction for two centuries; and the agricultural industry of Great Britain is now as much directed to the production of meat, milk, butter, cheese, as to the growth of corn and other cereals. The once simple husbandry of our ancestors has become a scientific manufacture.

There may be some persons still who object to machinery, because, having grown up surrounded with the benefits it has conferred upon them, without understanding the source of these benefits, they are something like the child who sees nothing but evil in a rainy day. The people of New Zealand very rarely came to us; but when they did come they were acute enough to perceive the advantages which machinery has conferred upon us, and the great distance in point of comfort between their state and ours, principally for the reason that they have no machinery, while we have a great deal. One of these men burst into tears when he saw a rope-walk; because he perceived the immense superiority which the process of spinning ropes gave us over his own countrymen. He was ingenious enough, and so were many of his fellow islanders, to have twisted threads together after a rude fashion; but he knew that he was a long way off from making a rope. The New Zealander saw the spinner in the rope-walk, moving away from a wheel, and gradually forming the hemp round his body into a strong cord. By the operation of the wheel he is enabled so to twine together a number of separate fibers, that no one fiber can be separated from the mass, but forms part of a hard and compact body. A series of these operations produces a cable, such as may hold a barge at anchor. The twisted fibers of hemp become yarn; many yarns be-

come a strand ; three strands make a rope ; and three ropes make a cablet, or small cable. By carefully untwisting all its separate parts, the principle upon which it is constructed is evident. The operation is a complex one ; and the rope-maker is a skilled workman. Rope-making machinery is now carried much further. But the wheel that twisted the hemp into yarn was a prodigy to the inquiring savage.



ANALYSIS OF A CABLE.

Another of these New Zealanders, and he was a very shrewd and intelligent person, carried back to his country from England, a small hand-mill for grinding corn, which he prized as the greatest of all earthly possessions. And well might he prize it ! He had no machine for converting corn into meal, but two stones, such as were used in the remote parts of the highlands of Scotland some years ago. And to beat the grain into meal by these two stones (a ma-

chine, remember, however imperfect) would occupy the labor of one fourth of his family, to procure subsistence for the other three fourths. The ancient Greeks, three thousand years ago, had improved upon the machinery of the hand-stones, for they had hand-mills. But Homer, the old Greek poet, describes the unhappy condition of the slave who was always employed in using this mill. The groans of the slave were unheeded by those who consumed the produce of his labor; and such was the necessity for meal, that the women were compelled to turn these mills when there were not slaves enough taken in war to perform this irksome office. There was plenty of labor then to be performed, even with the machinery of the hand-mill; but the slaves and the women did not consider that labor was a good in itself, and therefore they bitterly groaned under it. By and by the understandings of men found out that water and wind would do the same work that the slaves and the women had done; and that a large quantity of labor was at liberty to be employed for other purposes. Does any one ask if society was in a worse state in consequence? We answer, labor is worth nothing without results. Its value is only to be measured by what it produces. If, in a country where hand-mills could be had, the people were to go on beating grain between two stones, all would pronounce them fools, because they could obtain an equal quantity of meal with a much less expenditure of labor. Some have a general prejudice against that sort of machinery which does its work with very little human assistance; it is not quite so certain, therefore, that they would agree that a people would be equal fools to use the hand-mill when they could employ the wind-mill or the water-mill. But we believe they would think that, if flour could drop from heaven, or be had like water by whoever chose to seek it, it would be the height of folly to have stones, or hand-mills, or water-

mills, or wind-mills, or any machine whatever for manufacturing flour. Does any one ever think of *manufacturing* water? The cost of water is only the cost of the labor which brings it to the place in which it is consumed. Yet this admission overturns all objections against machinery.

We admit that it is desirable to obtain a thing with no labor at all; can we therefore doubt that it is desirable to obtain it with the least possible labor? The only difference between no labor and a little labor is the difference of the cost of production. And the only difference between little labor and much labor is precisely the same. In procuring any thing that administers to his necessities, man makes an exchange of his labor for the thing produced, and the less he gives of his labor the better of course is his bargain.

To return to the hand-mill and the water-mill. An ordinary water-mill for grinding corn will grind about one hundred and twenty bushels a day. To do the same work with a hand-mill would require one hundred and fifty men. At fifty cents a day the daily wages of these men would amount to \$75, which, reckoning six working days, is \$430 a week, or \$22,360 a year. The rent and taxes of a mill would be about \$800 a year. The cost of machinery would be certainly more for the hand-mills than the water-mill, therefore we will not take the cost of machinery into calculation. To produce, therefore, one hundred and twenty bushels of flour by hand we should pay \$75; by the water-mill we should pay \$2 56: that is, we should pay nearly thirty times as much by the one process as by the other. The actual saving is something about the ordinary price of the flour in the market; that is, the consumer, if the corn were ground by hand, would pay double what he pays now for flour ground at a mill.

But if the system of grinding corn by hand were a very

recent system of society, and the introduction of so great a benefit as the water-mill had all at once displaced the hand-grinders, as the spinning machinery displaced the spinning-wheel, what must become, it is said, of the one hundred and fifty men who earned the \$75 a day, of which sum the consumer has now got \$72 44 in his pocket? They must go to other work. And what is to set them to that work? The same \$72 44; which, being saved in the price of flour, gives the poor man, as well as the rich man, more animal food and fuel; a greater quantity of clothes, and of a better quality, a better house than his hand-laboring ancestors used to have, much as his house might yet be improved; better furniture, and more of it; domestic utensils; and books. To produce these things there must be more laborers employed than before. The quantity of labor is, therefore, not diminished, while its productiveness is much increased. It is as if every man among us had become suddenly much stronger and more industrious. The machines labor for us, and are yet satisfied without either food or clothing. They increase all our comforts, and they consume none themselves. The hand-mills are not grinding, it is true: but the ships are sailing that bring us foreign produce; the looms are moving that give us more clothes; the potter, and glass-maker, and joiner are each employed to add to our household goods; we are each of us elevated in the scale of society; and all these things happen because machinery has diminished the cost of production.

The water-mill is, however, a simple machine compared with some mills of modern times. We are familiar with the village-mill. As we walk by the side of some gentle stream, we hear at a distance the murmur of water and the growl of wheels. We come upon the old mill, such as it has stood for successive generations. No laborer quarrels with the mill. It is an object almost of his love, for he knows that

it cheapens his food. It seems a part of the natural scenery amid which he has been reared.

But let a more efficient machine for grinding corn be introduced into Great Britain, as is in operation at Rochester, or Pittsburg, and the English peasant would think that the working millers would be ruined. And yet the mills at



OLD ENGLISH MILL.

Rochester or Pittsburg make flour cheaper in England through that competition there which forces onward improvement in mill machinery; and by increasing the consumption of flour calls into action more superintending labor for its production. One particular mill at Pittsburg produces 500 barrels of flour per day, each containing 196 pounds, and employs the services of forty persons. It produces cheap flour by saving labor in all its processes. It stands on the bank of a navigable river—a high building into which the corn for grinding must be removed from boats alongside. Is the grain necessary to produce these

500 barrels of flour per day, amounting to 98,000 pounds, carried by man's labor to the topmost floor of that high mill? It is raised by an elevator consisting of an endless band, to which are fixed a series of metal cans revolving in a long wooden trough, which is lowered through the respective hatchways into the boats, and is connected at its upper end with the building where its belt is driven. The lower end of the trough is open, and as the endless band revolves, six or eight men shovel the grain into the ascending cans, which raise it so rapidly that 4000 bushels can be lifted and deposited in the mill in an hour. The drudging and unskilled laborers who would have toiled in carrying up the grain are free to do some skilled labor, of which the amount required is constantly increasing; and the cost saved by the elevator goes toward the great universal fund, out of which more labor and better labor are to find the means of employment.

CHAPTER XIII.

PRESENT AND FORMER CONDITION OF ENGLAND.—PROGRESS OF CULTIVATION.—EVIL
* INFLUENCE OF FEUDALISM.—STATE OF AGRICULTURE IN THE SIXTEENTH CENTURY.
—MODERN IMPROVEMENTS.—CULTIVATION.—AVERAGE CONSUMPTION OF WHEAT
IN GREAT BRITAIN.—IMPLEMENTS OF AGRICULTURE NOW IN USE.—NUMBER OF
AGRICULTURALISTS IN GREAT BRITAIN.

It is the remark of English tourists, as they travel from the sea-coast to London, that the country is a garden. It has taken nineteen centuries to make it such a garden. The marshes in which the legions of Julius Cæsar had to fight, up to their loins, with the Britons, to whom these swamps were habitual, are now drained. The dense woods in which the Druids worshiped are now cleared. Populous towns and cheerful vilages offer themselves on every side. Wherever the eye reaches, there is cultivation. Instead of a few scattered families painfully earning a subsistence by the chase, or by tilling the land without the knowledge and the instruments that science has given to the aid of manual labor—that cultivation is carried on with a systematic routine that improves the fertility of a good season, and diminishes the evils of a bad. Instead of the country being divided among hostile tribes, who have little communication, the whole territory is covered with a network of roads, and canals, and navigable rivers, and rail-roads, through which means there is a universal market, and wherever there is demand there is instant supply. Rightly considered, there is no branch of production which has so largely benefitted by the power of knowledge as that of

agriculture. It was ages before the great physical changes were accomplished which are now beheld on every side; and England is still in a state of progress toward the perfection of those results which an over-ruling Providence had in store for the human race, in the gradual manifestation of those discoveries which have already so changed our condition and the condition of the world.

The history of cultivation in Great Britain is full of instruction as regards the inefficiency of mere traditional practice and the slowness with which scientific improvement establishes its dominion. It is no part of our plan to follow out this history; but a few scattered facts may not be without their value.

The oppressions of tenants that were perpetrated under the feudal system, when ignorant lords of manors impeded production by every species of extortion, may be estimated by one or two circumstances. There can be no doubt that the prosperity of a tenant is the best security for the landlord's due share of the produce of the land. Without manure, in some form or other, the land can not be fertilized; the landlords knew this, but they required to have a monopoly of the fertility. Their tenants kept a few sheep, but the landlords reserved to themselves the exclusive privilege of having a sheepfold; so that the little tenants could not fold their own sheep on their own lands, but were obliged to let them be folded with those of their lord, or pay a fine. The flour-mill was the exclusive property of the manorial lord, whether lay or ecclesiastical; and whatever the distance, or however bad the road, the tenant could grind nowhere but at the lord's mill. No doubt the rent of land was exceedingly low, and the lord was obliged to maintain himself and his dependents by adding something considerable to his means by many forms of legalized extortion. The rent of land was so low because the produce was

inconsiderable, to an extent which will be scarcely comprehended by modern husbandmen. In the law-commentary called "Fleta," written about the end of the thirteenth century, the author says, the farmer will be a loser unless corn be dear, if he obtains from an acre of wheat only three times the seed sown. He calculated the low produce at six bushels an acre: the average produce was perhaps little higher; we have distinct records of its being no higher a century afterward. In 1390, at Hawsted, near Bury, the produce of the manor-farm was forty-two quarters of wheat, or three hundred and thirty-six bushels, from fifty-seven acres; and upon an average of three years sixty-one acres produced only seventy quarters, or five hundred and sixty bushels. Sir John Cullum, who collected these details from the records of his own property, says, "no particular dearth of corn followed, so that probably, those very scanty crops were the usual and ordinary effects of the imperfect husbandry then practiced." The husbandry was so imperfect that an unfavorable season for corn-crops, which in our days would have been compensated by a greater production of green crops, was followed by famine. When the ground was too hard, the seed could not be sown for want of the sufficient machine-power of plow and harrow. The chief instrument used was as weak and imperfect as the plow

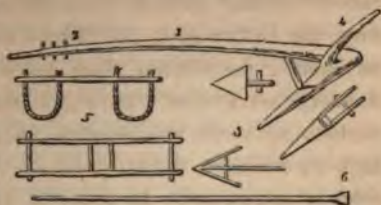


ANCIENT EGYPTIAN PLOW.

which we see depicted in Egyptian monuments, and which is still found in parts of Syria. The Oriental plowman was with such an instrument obliged to bend over his plow, and load it with all the weight of his

body, to prevent it merely scratching the ground instead of turning it up. His labor was great and his care inces-

sant, as we may judge from the words of our Saviour—"No man having put his hand to the plow, and looking back, is fit for the kingdom of God." Latimer, the Protestant martyr, in his "Sermon of the plow," in which he holds that "preaching of the Gospel is one of God's plow-works, and the preacher is one of God's plowmen," describes the labor upon which he raises his parallel: "For as the plowman first setteth forth his plow, and then tilleth his land and breaketh it in furrows, and sometimes ridgeth it up again; and at another time harroweth it and clotteth it, and sometimes dungeth it and hedgeth it, diggeth it and weedeth it, purgeth it and maketh it clean—so the prelate, the preacher, hath many divers offices to do."



1. The plow. 2. The pole. 3. Shares (various).
4. Handle. 5. Yokes. 6. Ox-goad.

Latimer was the son of an English farmer, and knew practically what he was talking about. He knew that the land would not bear an adequate crop without all this various and often-repeated labor. And yet the labor was so inadequately performed that a few years after he had preached this famous sermon, we are told by a credible writer of the times of Queen Mary—William Bulleyn, a physician and botanist—that in 1555 "bread was so scant, insomuch that the plain poor people did make very much of acorns." A few years onward a great impulse was given to husbandry through various causes, among which the increased abundance of the precious metals through the opening of the mines of South America had no inconsiderable influence. The industrious spirit of England was fairly roused from a long sleep in the days of Queen Elizabeth.

Harrison, in his "Description of Britain," says, "The soil is even now in these our days grown to be much more fruitful than it hath been in times past." This historian of manners saw the reason. "In times past" there was "idle and negligent occupation;" but when he wrote (1593), "our countrymen are grown to be more painful, skillful, and careful, through recompense of gain." The cultivators had their share of the benefits of cultivation; they had their "recompense of gain." Capital had been spread among the class of tenants; they were no longer miserable dependents upon their grasping lords. For a century or so onward, the improvements in agriculture were not very decided. The rotation of crops was unknown; and winter food for sheep and cattle not being raised, the greater number were slaughtered and salted at Martinmas.* The fleeces were wretchedly small, for the few sheep nibbled the stubble and commons bare till the spring-time. The carcases of beef were not half their present size. At the beginning of the last century the turnip cultivation was introduced, and in the middle of the century the horse-hoeing husbandry came into use. The agricultural revolution was fairly begun a hundred years ago; and yet, for many years, the value of manure was very imperfectly understood, and even up to our own time it has been wasted in every direction. There is given in Sir John Cullum's book, an abstract of the lease of an English farm in 1753. The tenant was to be allowed two shillings for every load of manure that he brought from a town about four miles distant. During twenty-one years the landlord was charged with only one load. At that period all agriculture was in a great degree traditional. There were no agricultural societies—no special journals for this great branch of national industry. Arthur Young applied his shrewd and observing talent to

* The eleventh of November.

the dissemination of farming knowledge; but the agricultural mind, with very few exceptions, rejected book-knowledge as vain and impertinent. Chemistry applied to the soil was as unknown to the cultivator as the perturbations of the planets. Geology was an affair of conjecture, and had assumed no form of utility. Meteorology entered into no farmer's mode of estimating the comparative value of one site and another. Sir John Cullum made a most curious and instructive estimate of the science of the farmers in the County of Suffolk, in 1784, when he wrote: "The farm-houses are in general well furnished with every convenient accommodation. Into many of them a *barometer* has of late years been introduced—a most useful instrument for the husbandman, and which is mentioned here as *a striking instance of the intelligence of this period.*"

It is estimated by some statisticians that the average consumption of wheat for each individual of the population of Great Britain is eight bushels. Others estimate that consumption at six bushels. It will be sufficient for a broad view of the increase of production in Great Britain, as compared with the increase of population, to take the consumption at eight bushels, or a quarter of wheat per head. In the ten years from 1801 to 1810, deducting an annual average of 600,000 quarters of foreign wheat and flour imported, the population in 1811 being 11,769,725, the number fed by wheat of home growth was somewhat above 11,000,000. In the ten years from 1841 to 1850, deducting an annual average of 3,000,000 quarters of foreign wheat and flour, the population in 1851 being 21,121,967, the number fed by wheat of home growth was somewhat above 18,000,000. The productive power of Great Britain had increased, in the course of fifty years, to the enormous extent of giving subsistence, in one article of agricultural produce alone, to 7,000,000 of people. The population in

1751 was estimated at little more than 7,000,000. It has trebled in a century; and we may be perfectly sure that the production of the land has far more than trebled in that period. The probability is that it has quadrupled; for there is no doubt that the great bulk of the people are better fed than in 1751, when rye-bread was the common sustenance of the great body of laborers throughout England.

Let us endeavor to take a rapid view of the implements of agriculture in common use at the present time—implements which have been described as “intended not to bring about new conditions of soil, nor to yield new products of any kind, but to do with more certainty and cheapness what had been done hitherto by employing the rude implements of former centuries.”

The object of agriculture is the conversion of mineral into organized matter, through the agency of the plants which are cultivated. The soil is the factory in which these changes principally take place, and one of the conditions necessary is contact with the atmosphere. To effect this, mechanical means are needed to open up and divide the soil: and in this respect *the plow* was early found to be a more efficient tool than either the spade or the pick, which are limited to manual labor. Notwithstanding the great antiquity and importance of the plow, it being the generally recognized symbol of agriculture, it has, until within a comparatively recent period, undergone fewer changes than most other implements of such universal use.

At the commencement of the present century, the plow and the harrow were almost the only instruments used in tillage. Bloomfield, an English poet, thus describes them:

“The plows move heavily, and strong the soil,
And clogging harrows with augmented toil
Dive deep.”

The old English plow used to be drawn with four horses;

and they were needed. It was a cumbersome instrument, mainly adapted to heavy clay soils. In the United States, the plow once most generally in use, was known as the old "Carey Plow." It had a clumsy wrought-iron share, wooden land-side and standard, and wooden mold-board, plated over with a piece of tin, sheet-iron, or old saw-plate, requiring the strength of a man to hold it by the two pins in its upright handles, and at least double the strength of team now required to do the same work. Then there was another plow, called the "Bar Side Plow," a flat bar forming the land-side, with a thick clump of iron like the half of a lance-head for the point, in the top of which the coulter was clumsily locked, and a wooden mold-board, without any pretensions to making a fit with the iron part. The plow which the Chinese use is similar, and the effect is the same as if a man should hold a sharp pointed shovel, back up, with an angle of forty-five degrees, and it should then be drawn forward with the point in the ground.

In Europe the plows have undergone but little change for centuries. The plow most generally used in France is the old Roman plow.

In the Southern United States, one of the rudest of all plows, called the "Shovel-plow," is in general use. It is usually made of a rough hewn stick for a beam, into which another stick is framed in, upon the end of which a piece of iron, much resembling a sharp-pointed shovel, is fastened. Two rough handles, pinned to the side of the beam, and supported at the proper angle by a wooden support, with a draft iron, or a piece of bark, in the loop of raw-hide at the forward end of the beam, completes the tool by which more than half the cotton-fields of the South are plowed.

The first great improvements in the construction of the plow, took place in the latter part of the eighteenth century, and are principally due to the efforts of English me-

ments of the Great English Exhibition, tells us that "the sower has almost vanished from southern England, driven out by a complicated machine, the drill, depositing the seed in rows, and drawn by several horses." We miss the sower; and the next generation may require a commentary upon the many religious and moral images that arose out of his primitive occupation. When James Montgomery says of the seed of knowledge, "broadcast it o'er the land," some may one day ask what "broadcast" means. But the drill does not only sow the seed; it can also de-



CULTIVATOR.

posit artificial manures for the reception of the seed. The bones that were thrown upon the dunghill are now crushed. The mountains of fertilizing matter that have been accumulated through ages on islands of the Pacific, from the deposits of birds resting in their flight upon rocks of that ocean, and which we call guano, now form a great article of commerce. Superphosphate of lime, prepared from bones, or from the animal remains of geological ages, is another of the precious dusts which the drill economizes. There are even drills for dropping water combined with superphosphate. "Such," says Mr. Pusey, "is the elastic yet accurate pliability with which, in agriculture, mechanism has seconded chemistry."

Of instruments for gathering the harvest, the most important are the reaping-machines. For these contrivances, upward of one hundred patents have been issued by the Patent Office at Washington, and the number sold in the United States during the past season (1855) has been immense. Indeed without the use of these machines, it would be impossible in many sections of our country to save the crops, through the want of laborers at the proper season. In Great Britain, where the weather is most uncertain, they are also invaluable for collecting and preserving the crops. In addition to the reapers, we have mowing machines capable when actuated by two horses of cutting an acre in sixty minutes, hay rakes for raking, and lastly, machines for pitching and spreading the grass when cut. Thus the farmer, with such helps, can wait until the dew has disappeared from his fields, and long before the sun has mounted to its noon-day height, cut and arrange an abundant day's work.



HORSE HAY-RAKE.

Machines for preparing grain for market are among the most important inventions of modern times. Here, indeed, agriculture assumes many of the external features of a

manufacture. The power of steam may be here advantageously applied. In England, on many of the large farms, there is a permanent steam-power, and most efficient has it been found. On smaller farms, movable steam-engines are often employed, and in some cases the engine is owned by the community, and the power rented to those who wish for it. In the United States, steam as an adjunct to agricultural labor has not yet been introduced to any considerable extent. Thrashing-machines are driven by horse-power, and the machines being movable, the grain is often thrashed at once in the field instead of being carried into the barn.



A THRASHING-MACHINE.

Rarely, now, can the beautiful description of Cowper be realized :

“Thump after thump resounds the constant flail
That seems to swing uncertain, and yet falls
Full on the destined ear.”

Few now wield that ancient instrument. Nor is the chaff now separated from the corn by the action of the wind, which was called winnowing, but we have the winnowing-machines, by which four hundred bushels of wheat can at once be taken from the thrashing-machine, and prepared for market in five hours. At the New York Crystal Palace, in 1853, a machine was exhibited, which was able not only to thrash and winnow the wheat, but which also measured the grain, placed it in bags ready for market, and recorded accurately the quantity measured—all by a continuous operation.



THRASHING BY CATTLE.

Contrast this achievement with the ancient method, still followed in some eastern countries, of thrashing grain by means of the feet of cattle.

One most interesting result which has followed the construction and general use of improved thrashing and winnowing-machines in the United States, has recently been pointed out by a distinguished American agriculturalist—which is, that since the introduction of these machines, some of the choicest varieties of wheat have been cultivated, which previously were so difficult of separation by hand-thrashing as to be excluded from the best wheat-growing districts of the country. Machines of this character are now in existence, which are capable of performing, with the help of a single horse, the labor of fifteen men. Some now urge that if a thrashing-machine will perform the labor of fifteen men, that fifteen men are thrown out of employment. But experience teaches that no such result ever follows; for such machines increase the requirement for labor by increasing the amount of land that can be cultivated. Some years ago one hundred acres in wheat was considered a large field, but there

are now farmers at the West who have fields of five hundred or one thousand acres. Without machinery, the cultivation of such extensive tracts could not be undertaken; and there is still another proof that these machines have not lessened the demand for labor, and that is, that higher wages have been paid during the last few years in the agricultural districts than ever before.

But machinery does not end here. The food of stock is prepared by machines. First, there is the turnip-cutter. Our "Farmer's Boy" will tell us how his sheep and kine were fed in the winter fifty years ago :

"No tender ewe can break her nightly fast,
Nor heifer strong begin the cold repast,
Till Giles with ponderous beetle foremost go,
And scattering splinters fly at every blow;
When, pressing round him, eager for the prize,
From their mixed breath warm exhalations rise."

We are told that "lambs fed with a turnip-cutter would be worth more at the end of a winter by two dollars a-head than lambs fed on whole turnips." The hay-cutter is a machine equally valuable.

The true principle upon which agriculture, as well as every other branch of industry, can only be profitably conducted, is, that machinery must be substituted for human muscles and strength to the greatest practicable extent. As a matter of profit, irrespective of all personal comfort, this conclusion is imperative. Man by the sweat of his brow alone shall eat bread. From this decree of his Creator there is no escape. Yet, nevertheless, there is much of good sense in the following remark which prefaced a recent report of an agricultural committee in New York. "In the doctrine of eternal hard work your committee do not believe." A most striking illustration of the effect of

improved systems of agriculture is given by M. Passy, of France, in his late work (*Système de Culture*). He states, as the result of careful investigation, that in those countries of Europe in which agriculture has improved, "the soils that in past times were regarded as too poor to merit continued and regular cultivation are now regarded as the best;" and after describing the course of things in this respect in Belgium and France, says that "in England it is an established fact that in various counties the lands denominated good are farmed at twenty-two to twenty-five shillings per acre, while those formerly regarded as poor let for thirty to thirty-five shillings."

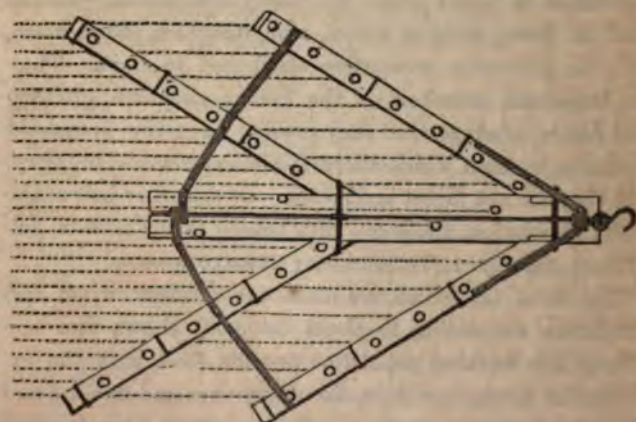
According to the census of 1851, the total population of Great Britain is 20,959,477—in round numbers, 21,000,000. In the "Return of Occupations," one half of this entire population is found under the family designation—such as child at home, child at school, wife, daughter, sister, niece, with no particular occupation attributed to them. They are important members of the State; they are growing into future producers, or they preside over the household comforts, without which there is little systematic industry. But they are not direct producers. Of the other half of the entire population, about one fifth belong to the class of cultivators, namely, 1,779,003 men; 229,678 women.

This total (in which we omit the farmers' wives and daughters, amounting to about 240,000) shows that one fifth of the working population provide food, with the exception of foreign produce, for themselves and families and the other four fifths of the population. Such a result could not be accomplished without the appliances of scientific power which we have described in this chapter.

The census of the United States for 1850, shows that nearly the same ratio exists in this country between the number of persons engaged in agricultural pursuits and the

entire population as in Great Britain—the entire population of the United States being 23,263,483, and the number of agriculturalists, 2,400,583.

In the early stages of society, a very small proportion of labor could be spared for other purposes than the cultivation of the soil. It has been held that a community is considerably advanced when it can spare one man in three from working upon the land. Only twenty-six per cent. of the adult males in Great Britain are agricultural—that is, three men labor at some other employment, while one cultivates the land. During the last forty years the proportion of agricultural employment, in comparison with manufacturing and commercial, has been constantly decreasing in Great Britain, and is now about twenty per cent., whereas in 1811 it was thirty-five per cent. of all occupations.



MODERN IMPROVED HARROW.

CHAPTER XIV.

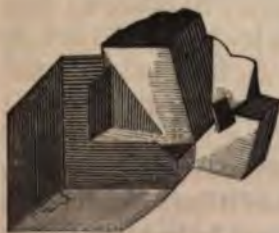
PRODUCTION OF A KNIFE.—MANUFACTURE OF IRON.—RAISING COAL.—THE HOT-BLAST.—IRON BRIDGES.—ROLLING BAR-IRON.—MAKING STEEL.—SHEFFIELD MANUFACTURES.—MINING IN GREAT BRITAIN.—NUMBERS ENGAGED IN MINES AND METAL MANUFACTURES.

WE have been speaking somewhat fully of agricultural instruments and agricultural labor, because they are at the root of all other profitable industry. Bread and beef make the bone and sinew of the workman. Plows and harrows and drills and thrashing-machines are combinations of wood and iron. Rude nations have wooden plows. Unless the American farmer made a plow out of two pieces of stick, and carried it upon his shoulder to the field, as the toil-worn and poor people of India do, he must have some iron about it. He can not get iron without machinery. He can not get even his knife, his tool of all-work, without machinery. From the first step to the last in the production of a knife, machinery and scientific appliances have done the chief work. People that have no science and no machinery sharpen a stone, or a bit of shell or bone, and cut or saw with it in the best way they can; and after they have become very clever, they fasten it to a wooden handle with a cord of bark. A member of a civilized community, examines two or three dozens of knives, selects which he thinks the best, and pays a quarter, or a half a dollar for it, the seller thanking him for his custom. The man who has nothing but the bone or the shell would gladly toil a month for that which does not cost an American laborer half a day's wages.

And how does the civilized man obtain his knife upon such easy terms? From the very same cause that he obtains all his other accommodations cheaper, in comparison with the ordinary wages of labor, than the inhabitant of most other countries—that is, from the operations of science, either in the making of the thing itself, or in procuring that without which it could not be made. We must always remember that, if we could not get the materials without scientific application, it would be impossible for us to get what is made of those materials—even if we had the power of fashioning those materials by the rudest labor.

Keeping this in mind, let us see how a knife could be obtained by a man who had nothing to depend upon but his hands.

Ready-made, without the labor of some other man, a knife does not exist; but the iron, of which the knife is made, is to be had. Very little iron has ever been found in a native state, or fit for the blacksmith. The little that has been found in that state is gathered up by the mineralogist and prized as a rarity; and if human art had not been able to procure any in addition to that, gold would have been cheap as compared with iron.



SULPHURET OF IRON.

Iron is, no doubt, very abundant in nature; but it is always mixed with some other substance that not only renders it unfit for use, but hides its qualities. It is found in the state of what is called *iron-stone*, or *iron-ore*. United with oxygen, it is often combined with silica, or the substance of flints, often with clay and other earthy substances. Another common and valuable ore of iron, is one in which the iron is com-

bined with sulphur; it possesses a bright yellow color, and is often, by the inexperienced, mistaken for gold—so little has it the appearance of iron. In short, in the state in which iron is frequently met with, it is a much more likely substance to be chosen for paving a road, or building a wall, than for making a knife.

But suppose that the man knows the particular ore or stone that contains the iron, how is he to get it out? Mere force will not do, for the iron, the oxygen, and the silica, or other substances, are so nicely mixed, that, though the ore were ground to the finest powder, the grinder is no nearer the iron than when he had a lump of a ton weight.

A man who has a block of wood has a wooden bowl in the heart of it; and he can get it out too by labor. The knife will do it for him in time; and if he take it to the turner, the turner with his machinery, his lathe, and his gouge, will work it out for him in half an hour. The man who has a lump of iron-ore has just as certainly a knife in the heart of it; but no mere labor can work it out. Shape it as he may, it is not a knife, or steel, or even iron—it is iron-ore; and dress it as he will, it would not cut better than a brickbat—certainly not so well as the shell or bone of the savage.

There must be knowledge before any thing can be done in this case. We must know what is mixed with the iron, and how to separate it. We can not do it by mere labor, as we can chip away the wood and get out the bowl; and therefore we have recourse to fire.

In the ordinary mode of using it, fire would make matters worse. If we put the material into the fire as a stone, we should probably receive it back as slag or dross. We must, therefore, prepare our fuel. Our fire must be hot, very hot; but if our fuel be wood we must burn it into charcoal, or if it be coal into coke.

The charcoal, or coke, answers for one purpose; but we have still the clay or other earth mixed with our iron, and how are we to get rid of that? Pure clay, or pure lime, or pure silica, remain stubborn in our hottest fires; but when they are mixed in a proper proportion, the one melts the other.

So charcoal or coke, and iron-stone or iron-ore, and limestone, are put into a furnace; the charcoal or coke is lighted at the bottom, and wind is blown into the furnace, at the bottom also. If that wind is not sent in by machinery, and very powerful machinery too, the effect will be little, and the work of the man great; but still it can be done.

In this furnace the lime and clay, or silica, unite, and form a sort of glass, which floats upon the surface. At the same time the carbon, or pure charcoal, of the fuel, with the assistance of the limestone, mixes with the stone, or ore, and melts the iron, which, being heavier than the other matters, runs down to the bottom of the furnace, and remains there till the workman lets it out by a hole made at the bottom of the furnace for that purpose, and plugged with sand. When the workman knows there is enough melted, or when the appointed time arrives, he displaces the plug of sand with an iron rod, and the melted iron runs out like water, and is conveyed into furrows made in sand, where it cools, and the pieces formed in the principal furrows are called "sows," and those in the furrows branching from them "pigs."

We are now advanced a considerable way toward the production of a knife. We have the materials of a knife. We have the iron extracted out of the iron-ore. Before we trace the progress of a knife to its final polish, let us see what stupendous efforts of machinery have been required to produce the cast-iron.

In every part of the operation of making iron—in smelting the iron out of the ore; in molding cast-iron into those articles for which it is best adapted; in working malleable iron, and in applying it to use after it is made; nothing can be done without fire, and the fuel that is used in almost every stage of the business is coal. The coal trade and the iron trade are thus so intimately connected, so very much dependent upon each other, that neither of them could be carried on to any extent without the other. The coal-mines supply fuel, and the iron-works give mining tools, pumps, railroads, wheels, and steam-engines, in return. A little coal might be got without the iron engines, and a little iron might be made without coals, by the charcoal of wood. But the quantity of both would be trifling in comparison. The wonderful amount of the production of iron in Great Britain, and the cheapness of iron, as compared with the extent of capital required for its manufacture, arises from the fact that the coal-beds and the beds of iron-ore lie in juxtaposition. The iron-stones alternate with the beds of coal in many English and American coal-fields; and thus the same mining undertakings furnish the ore out of which iron is made and the fuel by which it is smelted. If the coal were in the north, and the fuel in the south, the carriage of the one to the other would double the cost.

There was a time when iron was made in Great Britain with very little machinery. Iron was manufactured there in the time of the Romans; but it was made with great manual labor, and was consequently very dear. Hutton, in his "History of Birmingham," tells us that there is a large heap of cinders near that town which have been produced by an ancient iron-furnace; and that from the quantity of cinders, as compared with the mechanical powers possessed by our forefathers, the furnace must have been

constantly at work from the time of Julius Caesar. A furnace with a steam blast would produce as large a heap in a few years.

At present a cottager in the south of England, where there is no coal in the earth, may have a bushel of good coals delivered at the door of his cottage for twenty-five cents; although that is far more than the price of coal at the pit's mouth. If he had even the means of transporting himself and his family to the coal district, he could not, without machinery, get a bushel of coals at the price of a year's work. Let us see how a resolute man would proceed in such an undertaking.

The machinery, we will say, is gone. The mines are filled up, which the greater part of them would be, with water, if the machinery were to stop a single week. Let us suppose that the adventurous laborer knows exactly the spot where the coal is to be found. This knowledge, in a country that has never been searched for coals before, is no easy matter, even to those who understand the subject best: it is the province of geology to give that knowledge. But we shall suppose that he gets over that difficulty too, for after it there is plenty of difficulty before him.

Well, he comes to the exact spot that he seeks, and places himself right over the seam of coal. That seam is only a hundred fathoms below the surface, which depth he will, of course, reach in good time. To work he goes; pares off the green sod with his shovel, loosens the earth with his pickax, and, in the course of a week, is twenty feet down into the loose earth and gravel, and clears the rock at the bottom. He rests during the Sunday, and comes refreshed to his work on Monday morning; when, behold, there are twelve feet of water in his pit.

Suppose he now calls in the aid of a bucket and rope,

...till, as night closes, he has lowered
 Next morning it is up a foot and
 ...; he has done something, and next
 ...efforts, and brings the water down to
 ...is encouraging; but, from the depth,
 ...bucket with more difficulty, and it is
 ...the pit is dry. The weather changes;
 ...heavily; the surface on which it falls
 ...which he has reached is water-tight;
 ...his pit is filled to the brim. It is in

...even to a less depth than a hundred
 ...demands, notwithstanding all the im-
 ...achinery, a sum of not less than five
 ...thom, or fifty thousand dollars for the
 ...fore, supposing it possible for a single
 ...of twenty-five cents a day, the time
 ...quire would be between four hundred

...that the labor of between four hundred
 ...years is reduced to a single day? and
 ...of the carriage, would have cost
 ...is got for twenty-five cents? It is
 ...with man, and machinery is employed
 ...Nations that have no machinery have
 ...ignorant that there is hidden under
 ...which contributes more, perhaps, to
 ...of the inhabitants of Britain than
 ...ity which they enjoy.

...worked coal to any thing approaching
 ...which it has been worked by the English.

...that France, Belgium, Spain, Prussia,
 ...ited States, do not annually produce

more than seventeen million tons of coal, which is about half of the produce of Great Britain.*

The greater part of the coal now raised in Britain is produced by the employment of the most enormous mechanical power. There are in some places shallow and narrow pits, where coals may be raised to the surface by a windlass; and there are others where horse-power is employed. But the number of men that can work at a windlass, or the number of horses that can be yoked to a machine is limited. The power of the steam-engine is limited only by the strength of the materials of which it is formed. The power of a hundred horses, or of five hundred men, may be very easily made by the steam-engine to act constantly, and on a single point; and thus there is scarcely any thing in the way of mere force which the engine can not be made to do. We have seen a coal-pit in England, which hardly gave coal enough to maintain a cottager and his family, for he worked the pit with imperfect machinery—with a half-starved ass applied to a windlass. A mile off was a steam-engine of two hundred horse power, raising tons of coals and pumping out rivers of water with a force equal to at least a thousand men. This vast force acted upon a point, and, therefore, no advantage was gained over the machine by the opposing force of water, or the weight of the material to be raised. Before the steam-engine was invented, the produce of the English coal-mines barely paid the expense of working and keeping them dry; and had it not been for the steam-engines and other machinery, the supply would long before now have dwindled into a very small quantity, and the price would have become ten or twenty times its present amount. The quantity of coal

* The estimated amount of coal mined in Great Britain during the year 1853, was 37,000,000 tons: the estimated production in the United States during the year 1854, was 6,000,000 tons.

raised in Great Britain was estimated in 1851 at 35,000,000 tons; and the value at \$39,000,000 at the pit's mouth, and \$79,000,000 at the place of consumption. The capital engaged in the English coal trade was then valued at \$44,000,000. In 1847, the annual value of all the precious metals raised throughout the world was estimated at \$57,000,000. That value has been greatly increased within a few years, since the discovery of the gold-fields of California and Australia. But the coal of Great Britain, as estimated by the cost at the pit's mouth, is above two thirds of this value of the precious metals eight years ago; and the mean annual value, at the furnace, of iron smelted by British coal being \$35,000,000, the value together of English iron and coal exceeds the value of all the gold and silver of South America, and California, and Australia, however large that amount has now become.

How the value of our cast-iron has been increased by modern science may be in some degree estimated by a consideration of what the hot-blast has accomplished. The hot-blast blows hot air into the iron-furnace instead of cold air. The notion seems simple, but the results are wonderful. Much heat is required in the process of smelting, but the cold air blown in, as a blast, lowers the temperature, and compels the addition of fuel as a compensation for this reduction. The air is now heated before being introduced into the furnace, and by this application of science the quantity of coal is wonderfully economized. Formerly seven tons of coal were required to produce one ton of iron, but three tons now suffice. The amount produced in the same time is also nearly sixty per cent. greater.

The iron is greatly cheaper than a quarter of a century ago, for only about one half the coal formerly used is necessary for its production. That production is almost unlimited in amount. In 1788 Great Britain produced only 60,000

tons or one thirty-sixth part of what is now produced. The first iron bridge ever constructed, at Colebrook-dale, England, and which was erected in 1779, required 378 tons of cast-iron for its completion.



BRITANNIA BRIDGE.

The wonderful Britannia Bridge, erected in 1850, which has been carried over the Menai Strait, hung in mid-air at the height of 100 feet above the stream, has required 10,000 tons of iron for its completion. If chemistry and machinery had not been at work to produce more iron and cheaper iron, how would our great modern improvements have stopped short—our rail-roads, our water-pipes, our gas-pipes, our steamships! How should we have lacked the great material of every useful implement, from the gigantic anchor that holds the man-of-war firm in her moorings, and the mighty gun that, in the last resort, asserts a spirit without which all material improvement can not avert a nation's decay—to the steel-pen with which

thoughts are exchanged between friends at the opposite ends of the earth, and the needle by which the poor seamstress in her garret maintains her place among competing numbers.

Nearly all the people now engaged in iron-works in Great Britain are supported by the improvements that have been made in the manufacture, *by machinery*, since 1788. Yes, wholly by the machinery; for before then the quantity made by the charcoal of wood had fallen off one fourth in forty-five years. The wood for charcoal was becoming exhausted, and nothing but the powerful blast of a machine will make iron with coke. Without the aid of machinery the trade would have become extinct. The iron and the coal employed in making it would have remained useless in the mines.

And now, having seen what is required to produce a "pig" of cast-iron, let us return to the knife, whose course of manufacture we traced a little way.

The lump of cast-iron, as it leaves the furnace, has many processes to go through before it becomes fit for making a knife. It can not be worked by the hammer, or sharpened to a cutting edge; and so it must be made into malleable iron—into a kind of iron which, instead of melting in the fire, will soften, and admit of being hammered into shape, or united by the process of welding.

The methods by which this is accomplished vary, but they in general consist in keeping the iron melted in a furnace, and stirring it with an iron rake, till the blast of air in the furnace burns the greater part of the carbon out of it. By this means it becomes tough, and, without cooling, is taken from the furnace and repeatedly beaten by large hammers, or squeezed through large rollers, until it becomes the bar-iron of which so much use is made in every art of life. This process of converting cast-iron into malleable or

bar-iron, which is termed "*puddling*," will undoubtedly be superseded, at no distant day, by an American invention, already introduced, in which the malleable iron is, by one operation, manufactured directly from the ore, thus effecting an immense saving in fuel, time, machinery, and labor.

About the close of the last century the great improvement in the manufacture of bar-iron was introduced by passing it through grooved rollers, instead of hammering it on the anvil; but in our own time the invention has become most important. The inventor, Mr. Coet, spent a fortune on the enterprise, and died poor. His son, in 1812, petitioned the English Parliament to assign to him some reward for the great gift that his father had bestowed upon the nation. He asked in vain. It is the common fate of the ingenious and the learned; and it is well that life has some other consolations for the man that has exercised his intellect more profitably for the world than for himself, than the pride of the mere capitalist, who thinks accumulation, and accumulation only, the chief business of existence. Rolling bar-iron is one of the great labor-saving principles that especially prevail in every branch of manufacture in metals. The unaided strength of all the men in the world could not make all the iron which is at present made, though they did nothing else. Machinery is therefore resorted to; and water-wheels, steam-engines, and all sorts of powers are set to work in moving hammers, turning rollers, and drawing rods and wire through holes, till every workman can have the particular form which he wants. If it were not for the machinery that is employed in the manufacture, no man could obtain a spade for less than the price of a year's labor; the buckles of the harness of a horse would cost more than the horse himself; and the farmer would have to return to wooden plow-shares, and hoes made of sticks with crooked ends.

After all this, the iron is not yet fit for a knife, at least for such a knife as we may buy for a quarter. Many nations would, however, be thankful for a little bit of it, and nations too in whose countries there is no want of iron ore. But they have no knowledge of the method of making iron, and have no furnaces or machinery. When our ships sail among the people of the eastern islands, those people do not ask for gold. "Iron, iron!" is the call; and he who can exchange his best commodity for a rusty nail or a bit of iron hoop is a fortunate individual.

We are not satisfied with that in the best form, which is a treasure to those people in the worst. We must have a knife, not of iron, but of *steel*—a substance that will bear a keen edge without either breaking or bending. In order to get that, we must again change the nature of our material.

How is that to be done? The oftener that iron is heated and hammered, it becomes the softer and more ductile; and as the heating and hammering forced the carbon out of it, if we give it the carbon back again, we shall harden it; but it happens that we also give it other properties, by restoring its carbon, when the iron has once been in a ductile state.

For this purpose, bars or pieces of iron are buried in powdered charcoal, covered up in a vessel, and kept at a red heat for a greater or less number of hours, according to the object desired. There are niceties in the process, which it is not necessary to explain, that produce the peculiar quality of steel, as distinguished from cast-iron. If the operation of heating the iron in charcoal is continued too long, or the heat is too great, the iron becomes cast steel, and can not be welded; but if it is not melted in the operation, it can be worked with the hammer in the same manner as iron.

In each case, however, it has acquired the property upon which the keenness of the knife depends; and the chief difference between the cast steel and the steel that can bear to be hammered is, that cast steel takes a keener edge, but is more easily broken.

The property which it has acquired is that of bearing to be tempered. If it be made very hot, and plunged into cold water, and kept there till it is quite cooled, it is so hard that it will cut iron, but it is brittle. In this state the workman brightens the surface, and lays the steel upon a piece of hot iron, and holds it to the fire till it becomes of a color which he knows from experience is a test of the proper state of the process. Then he plunges it again into water, and it has the degree of hardness that he wants.

The grinding a knife, and the polishing it, even when it has acquired the requisite properties of steel, if they were not done by machinery, would cost more than the whole price of a knife upon which machinery is used. A traveling knife-grinder, with his treadle and wheels, has a machine, but not a very perfect one. The knife-maker grinds the knife at first upon wheels of immense size, turned by water or steam, and moving so quickly that they appear to stand still—the eye can not follow the motion. With these aids the original grinding and polishing cost scarcely any thing; while the traveling knife-grinder charges two cents or more for the labor of himself and his wheel in just sharpening it.

The "Sheffield whittle" is as old as the time of Edward III., as we know from the poet Chaucer. Sheffield is still the metropolis of steel. It is in the change of iron into steel by a due admixture of carbon—by hammering, by casting, by melting—that the natural powers of Sheffield, her water and her coal, have become of such value. Wherever there is a stream with a fall, there is the grinding-

wheel at work: and in hundreds of workshops the nicer labor of the artificer is fashioning the steel into every instrument which the art of man can devise, from the scythe of the mower to the lancet of the surgeon. The machinery that made the steel has called into action the skill that makes the file-cutter. No machine has yet been invented, which can make a perfect file. The file-cutter with a small hammer can cut notch after notch in a piece of softened steel, without a guide or gauge—even to the number of a hundred notches in an inch. It is one out of many things in which skilled labor triumphs over the uniformity of operation which belongs to a machine. The cutting of files alone in Great Britain gives employment to more than six thousand persons. This is one of the many instances in which it is evident that the application of machinery to the arts calls into action an almost infinite variety of handicrafts. An ordinary workman can obtain a knife for the price of a few hours' labor. The causes are easily seen. Every part of the labor that can be done by machinery is so done. One turn of a wheel, one stroke of a steam-engine, one pinch of a pair of rollers, or one blow of a die, will do more in a second than a man could do in a month. One man, also, has but one thing to do in connection with the machinery; and when the work of the hand succeeds to the work of the wheel or the roller, the one man, like the file-cutter, has still but one thing to do. In course of time he comes to do twenty times as much as if he were constantly shifting from one thing to another. The value of the work that a man does is not to be measured in all cases by the time and trouble that it cost him individually, but by the market value of what he produces: which value is determined, as far as labor is concerned, by the price paid for doing it in the best and most expeditious mode,

And does not all this machinery, and this economy of

labor, it may still be said, deprive many workmen of employment? No. By these means the iron trade gives bread to hundreds, where otherwise it would not have given bread to one. There are more hands employed at the iron-works than there would have been if there had been no machinery; because without machinery men could not produce iron cheap enough to be generally used.

The machinery that is now employed in the iron trade, not only enables the people to be supplied cheaply with all sorts of articles of iron, but it enables a great number of people to find employment, not in the iron trade only, but in all other trades, who otherwise could not have been employed; and it enables every body to do more work with the same exertion by giving them better tools; while it makes all more comfortable by furnishing them with more commodious domestic utensils.

There are thousands of families on the face of the earth, that would be glad to exchange all they have for a tin kettle, or an iron pot, which can be bought any where in the United States for a shilling or two. And could the poor man in this country but once see how even the rich man in some other places must toil day after day before he can scrape or grind a stone so as to be able to boil a little water in it, or make it serve for a lamp, he would account himself a poor man no more. A traveling beggar carries about with him more of the conveniences of life than are enjoyed by the chiefs or rulers in countries which naturally have much finer climates than that of England. But they have no machinery, and therefore they are wretched.

Great Britain is a country rich in other minerals than iron-stone and coal. Her earliest inhabitants are recorded to have exchanged tin with maritime people who came to her shores. They had lead also, which was cast into oblong blocks during the Roman occupation of the island, and

which bear the imperial stamp. At the beginning of the eighteenth century tin was worked into pewter, which, in the shape of plates, had superseded wooden trenchers. But the English raised and smelted no copper, importing it unwrought. The valuable tin and copper mines of Cornwall were imperfectly worked in the middle of the last century, because the water which overflowed them was only removed by hydraulic engines, the best of which was introduced in 1700. When Watt had reconstructed the steam-engine, steam-power began to be employed in draining the Cornwall mines. In 1780, 24,443 tons of copper-ore were raised, producing 2932 tons of copper. In 1850, 155,025 tons of ore were obtained, producing 12,254 tons of copper. The tin-mines produced 1600 tons in 1750, and 10,719 tons in 1849.

In all mining operations, conducted as they are in modern times, and in our own country, we must either go without the article produced, whether coal, or iron, or lead, or copper, if the machines were abolished—or we must employ human labor, in works the most painful, at a price which would not only render existence unbearable, but destroy it altogether. The people, in that case, would be in the condition of the unhappy natives of South America, when the Spaniards resolved to get gold at any cost of human suffering. The Spaniards had no machines but pickaxes and spades to put in the hands of the poor Indians. They compelled them to labor incessantly with these, until in some instances whole tribes became extinct. Without machinery, in places where people can obtain even valuable ore for nothing, the collection and preparation of metals is hardly worth the labor. Mungo Parke describes the sad condition of the Africans who are always washing gold-dust; and we have seen in England a poor man separating small parti-

cles of lead from the limestone, or spar, and unable to earn a shilling a day by the process. A man of capital erects lead-works, and in a year or two obtains an adequate profit, and employs many laborers.

It may enable us, in addition to our slight notices of quantities produced, to form something like an accurate conception of the vast mineral industry of Great Britain, if we give the aggregate of men employed as miners and metal-workers, according to the census of 1851. Of coal-miners there were 216,366; of iron-miners, 27,098; of copper-miners, 18,468; of tin-miners, 12,912; of lead-miners, 21,617. This is a total of 296,461. In the manufacture of various articles of iron and steel, in addition to the iron and coal-miners, who can not be accurately distinguished, there are employed 281,578 male workers, and 18,807 female; and in the manufacture of articles of brass and other mixed metals, 46,076; of which number 8,370 are females. The workers in metal thus enumerated amount to 542,922. We may add, from the class of persons engaged in mechanic productions, in which we find 48,050 engine and machine makers, and 7,429 gunsmiths, a number that will raise the aggregate of miners and workers in metals to 600,000 persons. The boldness of some of the operations which are conducted in this department of industry, the various skill of the laborers, and the vastness of the aggregate results, impress the mind with a sense of power that almost belongs to the sublime. The fables of mythology are tame when compared with these realities of science. Vulcan with his anvils in *Ætna*, is a feeble instrument by the side of the steam-hammer that forges an anchor, or the hydraulic press that lifts a bridge. A knot of Cupids co-operating for the fabrication of their barbed arrows is the poetry of painting applied to the arts. But there is higher poetry in that

triumph of knowledge, and skill, and union of forces, which fills a furnace with fifty thousand pounds of molten iron, and conducts the red-hot stream to the enormous mold which is to produce a cylinder without a flaw.



FROM ALBAN

CHAPTER XV.

CONVEYANCE AND EXHAUSTION OF STEAM—CONVEYANCE OF LUMBER—
EXHAUSTION OF THE GRADE BY THE INVENTION OF THE STEAM-ENGINE—
EXHAUSTION OF WOOD GRADE—WAST OF GRADE IN AMERICA—CANADA—
WAST OF 1850—RAIL-WAY EXHAUSTION—WAST-STEAM EXHAUSTION—EXHAUSTION
OF GRADE—CANADA.

We have seen how by machinery more than thirty-five million tons of coal—now become one of the very first necessities of life—are obtained, which without machinery could not be obtained at all in the thousandth part of the quantity: and which consequently would be a thousand times the price—would in fact be precious stones, instead of common fuel.

Engines or machines, of some kind or other, not only keep the pits dry and raise the coals to the surface, but convey them to the ship upon rail-roads: the ship, itself a machine, carries them round all parts of the coast: barges and boats convey them along the rivers and canals; and, within these few years, rail-ways have carried the coals of Pennsylvania and the other coal-fields of the Middle and Western States, into remote places of New England and New York, where it was formerly scarcely known as an article of domestic use and consumption. Even in Nantucket and New Bedford, those great oil markets of the world, gas manufactured from coal is superseding oil for purposes of illumination.

Through the general consumption of wood instead of coal, a fire for domestic use in France is a great deal dearer

than a fire in England or the United States; because, although the coal-pits of Great Britain or America are not to be found at every man's door, nor within many miles of the doors of some men, machinery at the pits, and ships and barges, and rail-ways, which are also machinery, enable the bulk of the population of Great Britain and the United States to enjoy the blessings of a coal fire at a much cheaper rate than a Frenchman can his fire of wood, which is not limited in its growth to any particular district. Without the machinery to bring coals to his door, not one man out of fifty of the present population of England could have had the power of warming himself in winter; any more than without the machines and implements of farming he could obtain food, or without those of the arts he could procure clothing. The sufferings produced by a want of fuel can not be estimated by those who have abundance. In Normandy, in France, very recently, such was the scarcity of wood, that persons engaged in various works of hand, as lace-making by the pillow, absolutely sat up through the winter nights in the barns of the farmers, where cattle were littered down, that they might be kept warm by the animal heat around them. They slept in the day, and were warmed by being in the same outhouse with cows and horses at night;—and thus they worked under every disadvantage, because fuel was scarce and very dear.

Coals were consumed in London in the time of Queen Elizabeth; but their use was, no doubt, very limited. Shakspeare, who always refers to the customs of his own time, makes Dame Quickly speak of "siting in my Dolphin-chamber at the round-table, by a sea-coal fire, on Wednesday in Whitsun week." But Mrs. Quickly was a luxurious person, who had plate, and tapestry, and gilt goblets. Harrison, in his "Description of Britain," at the same period, says, that coal is "used in the cities and towns that lie



A GOBLET.*

about the coast;" but he adds, "I marvel not a little that there is no trade of these into the interior; for want thereof the smiths do work their iron with charcoal." He adds, with great truth, "I think that far carriage be the only cause."

The consumption of coal in London in the last year of Charles II. (1685) amounted to 350,000 tons. This was really a large consumption, however insignificant it may sound when compared with the modern demand of the metropolis. In 1801 there were imported into London about a million tons of coal. In 1850, 3,600,000 tons were brought to the London market. The average contract price in the ten years ending 1810, was 45*s.* 6*d.*; in the ten years ending 1850, it was 18*s.* 6*d.* But in 1824 an oppressive duty of 7*s.* 6*d.* per ton on sea-borne coals was reduced to 4*s.*; and in 1831 the duty was wholly repealed. The citizens of the United States may well be grateful for the blessings of liberty and free government which they enjoy, when they call to mind that in "*free and enlightened England*" even to the present day, many of the chief materials of manufacture, and many of the great necessities and conveniences of life, such as wood and timber, bricks, paper, glass, tea, coffee, sugar, etc., are made universally dear by excessive taxation.

The chief power which produces coal and iron cheap is that of machinery. It is the same power which distributes these bulky articles through the country, and equalizes the cost in a considerable degree to the man who lives in New

* A Goblet from the Boar's Head Tavern, supposed to be that alluded to by Dame Quickly.

England and the man who lives in Georgia or Iowa. The difference in cost is the price of transport ; and machinery, applied in various improved ways, is every year lessening the cost of conveyance, and thus equalizing prices throughout the United States. The same applications of mechanical power enable a man to move from one place to another with equal ease, cheapness, and rapidity. Quick traveling has become cheaper than slow traveling. The time saved remains for profitable labor.

About a hundred and ninety years ago, when the first turnpike-road was formed in England, a mob broke the toll-gates, because they thought an unjust tax was being put upon them. They did not perceive that this small tax for the use of a road would confer upon them innumerable comforts, and double and treble the means of employment.

If there were no road, and no bridge, a man would take six months in finding his way from Boston to Philadelphia, if, indeed, he found it at all. He would have to keep the line of the hills, and deviate far from a straight line, in order that he might come upon the rivers at particular spots, where he would be able to jump over them with ease, or wade through them without danger.

When a man has gone up the bank of a river for twelve miles in one direction, in order to be able to cross it, he may find that, before he proceeds one mile in the line of his journey, he has to go along the bank of another river for twelve miles in the opposite direction ; and the courses of the river may be so crooked that he is really further from his journey's end than he was in the morning.

He may come to the side of a lake, and not know the end at which the river, too broad and deep for him to cross, runs out, and he may go twenty miles the wrong way, and thus lose forty.

Difficulties such as these are felt by every traveler in an uncivilized country. In reading books of travels, in Africa for instance, we sometimes wonder how it is that the adventurer proceeds a very few miles each day. We forget that he has no roads.

Two hundred years ago—even one hundred years ago—in some places fifty years ago—the roads of England were wholly unfit for general traffic and the conveyance of heavy goods. Pack-horses mostly carried on the communication in the manufacturing districts. The roads were as unfit for moving commodities of bulk, such as coal, wool, and corn, as the sandy roads of Poland were thirty years ago, and as many still are. An English gentleman who went upon the continent a few years ago to see what stores of wheat existed, found that in many parts the original price of wheat was doubled by the price of land conveyance for a very few miles.

In 1663 the first turnpike act, which was so offensive to some of the English people, was carried through parliament. It was for the repair of the "ancient highway and post-road leading from London to York," which was declared to be "very ruinous, and become almost impassable." This was, on many accounts, one of the most important lines of the country. Let us see in what state it was seventeen years after the passing of the act. In the "Diary of Ralph Thoresby," under the date of October, 1680, we have this entry: "To Ware, twenty miles from London, a most pleasant road in summer, and as bad in winter, because of the depth of the cart-ruts." Take another road a little later. In December, 1703, Charles III., King of Spain, in a visit to England, slept at Petworth on his way from Portsmouth to Windsor, and Prince George of Denmark went to meet him there by desire of the Queen. The distance from Windsor to Petworth is about forty miles. In the

relation of the journey given by one of the prince's attendants, he states: "We set out at six in the morning, by torchlight, to go to Petworth, and did not get out of the coaches (save only when we were overturned or stuck fast in the mire) till we arrived at our journey's end. 'T was a hard service for the prince to sit fourteen hours in the coach that day without eating any thing, and passing through the worst ways I ever saw in my life. We were thrown but once indeed in going, but our coach, which was the leading one, and his Highness's body-coach, would have suffered very much, if the nimble boors of Sussex had not frequently poised it, or supported it with their shoulders, and the nearer we approached the duke's house the more inaccessible it seemed to be. The last nine miles of the way cost us six hours' time to conquer them." From the county-town of Sussex, about the beginning of the reign of George III., the roads were never in such a condition as to allow sheep or cattle to be driven on them to the London market; and consequently, there not being sufficient demand at home to give a remunerating price, the beef and mutton were sold at a rate far below the average to the small population in the country, which was thus isolated from the common channels of demand and supply.

In the Highlands of Scotland, at the beginning of the present century, the communication from one district to another was attended with such difficulty and danger, that some of the counties were excused from sending jurors to the circuit to assist in the administration of justice. The poor people inhabiting these districts were almost entirely cut off from intercourse with the rest of mankind. The Highlands were of less advantage to the British empire than the most distant colony. Parliament resolved to remedy the evil; and, accordingly, from 1802 to 1817, the sum of two hundred thousand pounds was laid out in making

roads and bridges in these mountainous districts. Mark the important consequences to the people of the Highlands, as described by Mr. Telford, the engineer of the roads :

“ Since these roads were made accessible, wheelwrights and cartwrights have been established, the plow has been introduced, and improved tools and utensils are used. The plow was not previously used in general ; in the interior and mountainous parts they frequently used crooked sticks with iron on them, drawn or pushed along. The moral habits of the great mass of the working classes are changed ; they see that they may depend on their own exertions for support. This goes on silently, and is scarcely perceived until apparent by the results. I consider these improvements one of the greatest blessings ever conferred upon any country. About two hundred thousand pounds has been granted in fifteen years. It has been the means of advancing the country at least one hundred years.”

There are many parts of Ireland which sustained the same miseries and inconveniences from the want of roads as the Highlands of Scotland did at the beginning of the present century. In 1823, Mr. Nimmo, an engineer, stated to parliament that the fertile plains of Limerick, Cork, and Kerry, in Ireland, were separated from each other by a deserted country, presenting an impassable barrier between them. This region was the retreat of smugglers, robbers, and culprits of every description ; for the tract was a wild, neglected, and deserted country, without roads, culture, or civilization. The government ordered roads to be made through this barren district. We will take one example of the immediate effect of this road-making, as described by a witness before parliament : “ A hatter had a small field through which the new road passed ; this part next the town was not opened till 1826. In making arrangements with him for his damages, he said that he ought to make

me (the engineer) a present of all the land he had, for that the second year I was at the roads he sold more hats to the people of the mountains alone than he did for seven years before to the high and low lands together. Although he never worked a day on the roads, he got comfort and prosperity by them."

The hatter got comfort and prosperity by the roads, because the man who had to sell and the man who had to buy were brought closer to each other by means of the roads. When there were no roads, the hatter kept his goods upon the shelf, and the laborer in the mountains went without a hat. When the laborer and the hatter were brought together by the roads, the hatter soon sold off his stock, and the manufacturer of hats went to work to produce him a new stock; while the laborer, who found the advantage of having a hat, also went to work to earn more money, that he might pay for another when he should require it. It became a fashion to wear hats, and of course a fashion to work hard, and to save time, to be able to pay for them. Thus the road created industry on both sides—on the side of the producer of hats and that of the consumer.

Instances such as these of the want of communication between one district and another are now very rare indeed either in England or the United States. But if we look to countries intimately connected with our own, we shall find no lack of examples of a state of commercial intercourse attending a want of roads. The gold-fields of Australia have largely stimulated the export of manufactured goods from England and the United States. One of the colonists at Sydney writes thus to the chief organ of intelligence in England:—"The roads throughout the colony, as they were, are now worse than ever. The inland can not run by night, and stick fast and upset in all

directions by day. Communication with the interior towns is possible only at an enormous cost. The price of conveying a ton of goods from Sydney to Bathurst, about 130 miles, is eight times the freight of the same quantity from London to Sydney. In cost of conveyance London and Liverpool are, in fact, only sixteen miles from Sydney by land, though the distance by sea is sixteen thousand. We here see daily the most striking illustration of the truth that

"Seas but join the regions they divide."

Cargoes are poured into the sea-ports with the greatest facility, and then the distribution is suddenly checked. Hence the enormous rents of stores, cessation of demand, and the necessity of forced sales, with the natural consequence—heavy losses to the exporters, who perhaps wonder how trade with Australia can be so unprofitable, scarcely suspecting one of the main causes of its uncertainty. Foreign merchants might do worse than help to open up the internal communications of this continent."

The city of Sydney has a wharfrage two miles in extent. The communication from the port to the interior is thus described:—"Imagine a great rail-road, instead of terminating in a splendid station, with every means of conveying and removing goods to roads in every direction, ending suddenly in swamp, forest, and sand, through which, by dint of lashing, and swearing, and unloading, and re-loading, a team of bullocks and a dray drag their goods ten miles *per diem*, at \$200 or \$350 per ton for the journey. The channel of trade is all that civilization, science, and capital can make it, from the threshold of the English or American factory to the edge of the Sydney wharf. There it breaks suddenly, and beyond all is primitive, rude, and barbarous in the means of conveyance. The bale of goods last unloaded from the rail-way train is transferred

to the bullock dray, to begin its 'crawl' up the country, costing all its freight across the ocean for every twenty miles. It can not be otherwise. There are no passable roads."

It is impossible to have a more vivid picture than this of the sudden impediment which the commercial enterprise of one country receives from the want of the commonest means of communication in another. The bullock-cart of Syria, and the Australian bullock-cart, would be useful instruments if they had roads to work in. But there must be general civilization before there are extensive roads. Carts and bullocks are of readier creation than roads. It has taken eighteen centuries to make the English roads, and the Romans, the kings of the world, were the great road-makers, whose works still remain :

"Laboring pioneers,
A multitude with spades and axes armed,
To lay hills plain, fell woods, or valleys fill,
Or where plain was, raise hill, or overlay
With bridges rivers proud, as with a yoke."—PARADISE REGAINED.

What the Romans were to England, the emigrants must be to Australia and California. But the discovery of great natural wealth, the vigor of the race, the intercourse with commercial nations of the old and new worlds, the free institutions which have been transplanted there without any arbitrary meddling or chilling patronage, will effect in a quarter of a century what the parent people, struggling with ignorant rulers and feeble resources, have been so long in accomplishing.

The Canals of England date only for a hundred years back. The first Act of Parliament for the construction of a canal was passed in 1755. The Duke of Bridgewater obtained his first Act of Parliament in 1759, for the con-

struction of those noble works which will connect his memory with those who have been the greatest benefactors of their country. The great manufacturing prosperity of England dates from this period; and it will be forever associated with the names of Watt, the improver and almost the inventor of the steam-engine—of Arkwright, the presiding genius of cotton-spinning—and of Brindley, the great engineer of canals. In the conception of the vast works which Brindley undertook for the Duke of Bridgewater, there was an originality and boldness which may have been carried further in recent engineering, but which a century ago were the creators of works which were looked upon as marvels. To cut tunnels through hills—to carry mounds across valleys—to build aqueducts over navigable rivers—were regarded then as wild and impracticable conceptions. Another engineer, at Brindley's desire, was called in to give an opinion as to a proposed aqueduct over the river Irwell. He looked at the spot where the aqueduct was to be built, and exclaimed, "I have often heard of castles in the air, but never before was shown the place where any of them were to be erected." Brindley's castle in the air still stands firm; and his example, and that of his truly illustrious employer, have covered both England and the United States with many such fabrics, which owe their origin not to the government, but to the people.

The navigable canals of England are more than two thousand miles in length. For the slow transport of heavy goods they hold their place against the competition of railroads, and continue to be important instruments of internal commerce. When rail-ways were first projected, it is said that an engineer, being asked what would become of the canals if the new mode of transit were adopted, answered that they would be drained and become the beds of rail-ways. Like many other predictions connected with the last

great medium of internal communication, the engineer was wholly mistaken in his prophecy.

The great principle of exchange between different sections and districts, has covered the country with good roads, with canals, and finally with rail-ways. The rail-way and the steam-carriage have carried the principle of diminishing the price of conveyance, and therefore of commodities, by machinery, to an extent which makes all other illustrations almost unnecessary. A road with a wagon moving on it is a mechanical combination; a canal, with its locks, and towing-paths, and boats gliding along almost without effort, is a higher mechanical combination; a railway, with its locomotive engine, and carriage after carriage dragged along at the rate of thirty or forty miles an hour, is the highest of such mechanical combinations. The force applied upon a level turnpike-road, which is required to move 1,800 pounds, if applied to drag a canal-boat will move 55,500 pounds, both at the rate of two and a half miles per hour. But we want economy in time as well as economy in the application of motive power. It has been attempted to apply speed to canal traveling. Up to four miles an hour the canal can convey an equal weight more economically than a rail-road; but after a certain velocity is exceeded, that is thirteen and a half miles an hour, the horse on the turnpike-road can drag as much as the canal-team. Then comes in the great advantage of the rail-road. The same force that is required to draw 1,900 pounds upon a canal, at a rate above thirteen and a half miles an hour, will draw 14,400 pounds upon a railway, at the rate of thirteen and a half miles an hour. The producers and consumers are thus brought together, not only at the least cost of transit, but at the least expenditure of time. The road, the canal, and the rail-way have each their distinctive advantages; and it is worthy of note how they work together. From every

rail-way station there must be a road to the adjacent towns and villages, and a better road than was once thought necessary. Horses are required as much as ever, although mails and coaches are no longer the glories of the road; and the mail finds its way into every hamlet by the united agency of the road and the rail-way.

Roger North described an English Newcastle rail-way in 1680: "Another thing that is remarkable is their way-leaves; for when men have pieces of ground between the colliery and the river, they sell leave to lead coals over their ground; and so dear that the owner of a rood of ground will expect twenty pounds per annum for his leave. The manner of the carriage is by laying rails of timber, from the colliery down to the river, exactly straight and parallel; and bulky carts are made with four rowlets fitting these rails; whereby the carriage is so easy that the horse will draw down four or five chaldrons of coals, and is an immense benefit to the coal-merchant." Who would have thought that this contrivance would have led to no large result till a hundred and fifty years had passed away? Who could have believed that "the rails of timber, exactly straight and parallel," and the "bulky carts with four rowlets exactly fitting the rails," would have changed the face, and to a great degree the destinies of the world?

In the olden and more thickly peopled portions of the United States, an equal and in some respects a greater advance has been made in improving the means of transportation and intercommunication, than exists in Great Britain. Massachusetts especially is completely covered with a network of rail-way, and in one county, of no inconsiderable extent, a rail-road it is said intersects every town. The total length of rail-roads completed and in use in the United States on the 1st of January, 1855, was estimated at 23,242 miles; and that in various stages of progress, and in

the hands of engineers, at 18,000 miles more, making in all a total of some 40,000 miles already constructed, or to be constructed within a few years. The capital invested in rail-ways in the United States, is estimated at nearly \$700,000,000. According to official returns, the total length of rail-roads open and in use in Great Britain in 1852, was 6,890 miles.

The length of the various telegraph lines in the United States in active operation is upward of 41,000 miles, costing nearly \$7,000,000.

It is now about a century since Benjamin Franklin, Postmaster-General of the American Colonies, by appointment of the Crown, set out in his old gig to make an official inspection of the principal routes. It is about eighty years since he held the same office under the authority of Congress, when a small folio (now preserved in the department at Washington), containing but three quires of paper, lasted as his account-book for two years. These simple facts bring up before us, more forcibly than an elaborate description, the vast increase in post-office facilities within a hundred years. For if a Postmaster-General was to undertake to pass over all the routes at present existing, it would require six years of incessant rail-road travel, at the rate of a hundred and twenty-five miles daily; while if he was to undertake the job in an "old gig" he would require a life-time for its performance. Instead of a small folio, with its three quires of paper, the post-office accounts consume every two years, three thousand of the largest sized ledgers, keeping no less than one hundred clerks constantly employed in recording transactions with thirty thousand contractors and other persons.

Even as late as the year 1790, the post-office facilities were a mere trifle, at least as compared with the present time. There were, at that period, but 1,875 miles of post-routes, or about the same number as there are now in Ore-

gon; and only seventy-five post-offices. The mail was often a week between New England and Philadelphia; a fortnight between Boston and Savannah; and in the winter almost as long in going between Philadelphia and Pittsburg.



BENJAMIN FRANKLIN.

In 1800 the the post-office business of the whole United States did not exceed that of the State of New York at the

present time. As late as 1810 there but 2,300 post-offices, or only a tithe of the number there is at present; while the receipts were but little over \$500,000, against \$6,000,000 now. In fact fifty per cent. more postage is paid at the present time on newspapers and magazines, than was paid on letters, newspapers, and every description of mailable matter in 1810. The great impulse has been given since 1830. At that period there were only 115,000 miles of post-routes, whereas now there are nearly twice that quantity. Then there were less than 9,000 post-offices; now there are over 23,000. The last five-and-twenty years have, therefore, exhibited a progress, in this department of civilization, that is in advance even of the growth of the population, rapid as that has been.

The whole number of mail-routes now existing in the United States, is 6,692; aggregate length 217,743 miles; annual transportation 61,892,542 miles; of which there are on rail-roads 12,986,705 miles; on steamboats 6,685,065 miles; in coaches 21,330,326 miles; and in modes not specified, 20,890,446 miles. And yet notwithstanding these statistics, which show a progress within a century almost exceeding belief, the American postal system is the worst managed department of the government, inferior to the systems of England or France, and a disgrace to the nation.

When William Hutton, in the middle of last century, started from Nottingham (where he earned a scanty living as a bookbinder) and walked to London and back for the purpose of buying tools, he was nine days from home, six of which were spent in going and returning. He traveled on foot, dreading robbers, and still more dreading the cost of food and lodging at public houses. His whole expenses during this toilsome expedition were only ten shillings and eight pence; but he contented himself with the barest necessities, keeping the money for his tools sewed up his shirt-

collar. If William Hutton had lived in these days, he would, upon sheer principles of economy, have gone to London by the rail-road train at a cost of twenty shillings for his transit, in one forenoon, and returned in another. The twenty shillings would have been sacrificed for his conveyance, but he would have had a week's labor free to go to work with his new tools; he need not have sewed his money in his shirt-collar for fear of thieves; and his shoes would not have been worn out and his feet blistered in his toilsome march of two hundred and fifty miles.

In consequence of the inattention of the people of England and the continent of Europe to roads, and the wretched state in which these were usually kept, it was long before the use of coaches of any kind came into fashion. Although wheeled vehicles of various kinds were in use among the ancients, the close carriage, or coach, is of modern invention. Charles I. was the first English sovereign who had a state coach, and a Scotch writer of 1617 speaks of coaches as recently introduced and still rare in Scotland.

It is a very curious fact that the same sort of complaints which have been made in England and the United States, within the past thirty years, respecting the introduction of rail-way communication, were also made when coaches were first introduced. In a pamphlet called the "*Great Concern of England Explained*," published in 1673, the writer very gravely attempts to make out that the introduction of coaches was ruining the trade of England. The following is an example of his method of reasoning: "Before coaches were set up, travelers rode on horseback, and men had boots, spurs, saddles, bridles, saddle-cloths, and good riding-suits, coats and cloaks, stockings and hats, whereby the wood and leather of the kingdom was consumed. Besides, most gentlemen, when they traveled on horseback, used to

ride with swords, belts, pistols, holsters, portmanteaus and hat-cases, for which in these coaches they have little or no occasion. For when they rode on horseback, they rode in one suit, and carried another to wear when they came to their journey's end; but in coaches they ride in a silk suit, silk stockings, beaver hats, etc., and carry no other with them. This is because they escape the wet and dirt, which upon horseback they can not avoid; whereas, in two or three journeys on horseback, these clothes and hats were wont to be spoiled; which done they were forced to have new very often, and that increased the consumption of manufactures." Further on the same writer puts the following query: "Is it for a man's health or business to be laid fast in four ways; to ride all day with strangers, oftentimes sick, diseased, ancient persons, or young children crying; all whose humors he is obliged to put up with, and is often poisoned by their nasty scents, and crippled with their boxes and bundles?" As an additional objection against the introduction of coaches, the writer urges that they will discourage the breeding, and lessen the value of horses, an argument which, it is amusing to observe, was used in Massachusetts a few years since, when it was proposed to construct the rail-road from Boston to Albany. Arguments of a similar absurd nature are now used in reference to almost every proposed amelioration of our social condition, and will, doubtless, a century hence, be quoted as evidence of the short-sightedness of the present generation, although they now receive countenance and support from a large proportion of the community.

Notwithstanding the introduction of stage-coaches into England, the popular mode of transportation, up to the commencement of the present century, was by means of large cumbersome wagons, drawn by six or eight horses, and devoted chiefly to the carriage of merchandise. The

only part of the vehicle which afforded accommodation to passengers was the tail of the wagon, as it was called—a reserved space at the hind end—and here, seated upon straw, the passengers were slowly conveyed upon their journey. The incidents of travel in these vehicles are graphically described by Smollet, in his story of Roderick Random. Wagons of a similar character are still in use in Virginia, for the transportation of goods and plantation produce. They are provided with huge broad wheels, covered with canvas sustained upon hoops, and usually drawn by six horses or mules, the driver riding upon one of them. They are extremely unwieldy in form and structure, and are usually drawn with a needless expenditure of power.



BRIDGE AND ROAD AMONG THE ANDES.

A very few years ago it was not uncommon to hear men say that the wonderful results of improved locomotion, the greatest triumphs of modern skill, were not a blessing; for the machinery had put somebody out of employ. Baron

Humboldt, a traveler in South America, tells us that, upon a road being made over a part of the great chain of mountains called the Andes, the government was petitioned against the road by a body of men who for centuries had gained a living by carrying travelers in baskets strapped upon their backs over the fearful rocks, which only these guides could cross. Which was the better course, to make the road, and create the thousand employments belonging to freedom of intercourse, for these very carriers of travelers, and for all other men, or to leave the mountains without a road, that the poor guides might gain a premium for risking their lives in an unnecessary peril? But, looking at their direct results, we have no doubt that rail-roads have greatly multiplied the employments connected with the conveyance of goods and passengers. In 1853 there were eighty thousand persons employed upon the rail-roads of Great Britain in various capacities. This does not include those employed in working upon lines that are not open for traffic, which class in England amounted to twenty-five thousand persons in 1853. But the indirect occupations called into activity by rail-roads are so numerous as to defy all attempts at calculating the numbers engaged in them. No doubt many occupations have been changed by rail-roads; there are fewer coachmen, postboys, wagoners, and the like. But it is equally certain that both in England and the United States there are far more persons employed at present than formerly in conducting the internal communications of the two countries, effecting that great addition to their productive powers, without which all other production would languish and decay.

The vast extension, and the new channels of our foreign commerce have been greatly affected by the prodigious facilities of our internal communication. They have created, in a measure, special departments of industry, which can be

most advantageously pursued in particular localities; but which rail-ways and steam-vessels have united with the whole country and with the habitable globe. The reindeer connects the Laplander with the markets of Sweden, and draws his sledge over the frozen wilds at a speed and power of continuance only rivaled by the locomotive. The same beneficent Providence which has given this animal to the inhabitant of the polar regions—not only for food, for clothing, but for transport to associate him with some civilization—has bestowed upon us the mighty power of steam, to connect us with the entire world, and render nations, otherwise distant, near neighbors.



TRAVELING IN LAPLAND.

CHAPTER XVI.

HOUSES.—THE PYRAMIDS.—MECHANICAL POWER.—CARPENTERS' TOOLS.—AMERICAN MACHINERY FOR BUILDING.—BRICKS.—SLATE.—HOUSEHOLD FITTINGS AND FURNITURE.—PAPER-HANGINGS.—CARPETS.—GLASS.—POTTERY.—PALISSY AND WEDGEWOOD.—COMMERCIAL VALUE OF TASTE.

THE beaver builds his huts with the tools which nature has given him. He gnaws pieces of wood in two with his sharp teeth, so sharp that the teeth of a similar animal, the agouti, form the only cutting-tool which some rude nations possess. When the beavers desire to move a large piece of wood, they join in a body to drag it along.

Man has not teeth that will cut wood : but he has reason, which directs him to the choice of much more perfect tools.

Some of the great monuments of antiquity, such as the pyramids of Egypt, are constructed of enormous blocks of stone brought from distant quarries. We have no means of estimating, with any accuracy, the mechanical knowledge possessed by the people engaged in these works. It was, probably, very small, and, consequently, the human labor employed in such edifices was not only enormous in quantity, but exceedingly painful to the workmen. The Egyptians, according to Herodotus, a Greek writer who lived two thousand five hundred years ago, hated the memory of the kings who built the pyramids. He tells us that the great pyramid occupied a hundred thousand men for twenty years in its erection without counting the workmen who were employed in hewing the stones, and in conveying

them to the spot where the pyramid was built. Herodotus speaks of this work as a torment to the people; and doubtless the labor engaged in raising huge masses of stone, that was extensive enough to employ a hundred thousand men for twenty years, which is equal to two millions of men for one year, must have been fearfully tormenting without machinery, or with very imperfect machinery. It has been calculated that about half the steam-engines of England, worked by thirty-six thousand men, would raise



PYRAMIDS AND SPHYNX.

the same quantity of stones from the quarry, and elevate them to the same height as the great pyramid, in the short time of eighteen hours. The people of Egypt groaned for twenty years under this enormous work. The laborers groaned because they were sorely taxed; and the rest of the people groaned because they had to pay the laborers. The laborers lived, it is true, upon the wages of their labor, that is, they were paid in food—kept like horses—as the reward of their work. Herodotus says that it was

recorded on the pyramid that the onions, radishes, and garlic which the laborers consumed, cost sixteen hundred talents of silver; an immense sum, equivalent to several millions of dollars. But the onions, radishes, and garlic, the bread, and clothes of the laborer, were wrung out of the profitable labor of the rest of the people. The building of the pyramid was an unprofitable labor. There was no immediate or future source of profit in the pyramid; it produced neither food, nor fuel, nor clothes, nor any other necessary. The labor of a hundred thousand men for twenty years, stupidly employed upon this monument, without an object beyond that of gratifying the pride of the tyrant who raised it, was a direct tax upon the profitable labor of the rest of the people.

"Instead of useful works, like nature great,
Enormous cruel wonders crushed the land."

But admitting that it is sometimes desirable for nations and governments to erect monuments which are not of direct utility—which may have an indirect utility in recording the memory of great exploits, or in producing feelings of reverence or devotion—it is clearly an advantage that these works, as well as all other works, should be performed in the cheapest manner; that is, that human labor should derive every possible assistance from mechanical aid. We will give an illustration of the differences of the application of mechanical aid in one of the first operations of building—the moving a block of stone. The following statements are the result of actual experiment upon a stone weighing ten hundred and eighty pounds:

To drag this stone along the smoothed floor of the quarry required a force equal to seven hundred and fifty-eight pounds. The same stone dragged over a floor of planks required six hundred and fifty-two pounds. The same stone placed on a platform of wood, and dragged over the s

floor of planks, required six hundred and six pounds. When the two surfaces of wood were soaped as they slid over each other, the force required to drag the stone was reduced to one hundred and eighty-two pounds. When the same stone was placed upon rollers three inches in diameter, it required, to put it in motion along the floor of the quarry, a force only of thirty-four pounds; and by the same rollers upon a wooden floor, a force only of twenty-eight pounds. Without any mechanical aid, it would require the force of four or five men to set that stone in motion. With the mechanical aid of two surfaces of wood soaped, the same weight might be moved by one man. With the more perfect mechanical aid of rollers, the same weight might be moved by a very little child.

From these statements it must be evident that the cost of a block of stone very much depends upon the quantity of labor necessary to move it from the quarry to the place where it is wanted to be used. We have seen that with the simplest mechanical aid labor may be reduced sixty-fold. With more perfect mechanical aid, such as that of water-carriage, the labor may be reduced infinitely lower. Thus, the streets of New Orleans are paved with granite from Massachusetts at a moderate expense.

The cost of timber, which enters so largely into the cost of a house, is in a great degree the cost of transport. In countries where there are great forests, timber-trees are worth nothing where they grow, except there are ready means of transport. In many parts of the United States and Canada, the great difficulty which the people find is in clearing the land of the timber. The finest trees are not only worthless, but are a positive incumbrance, except when they are growing upon the banks of a great river; in which case the logs are thrown into the water, or formed into rafts, being floated several hundred miles at scarcely

any expense. The same stream which carries them to a seaport turns a mill to saw the logs into planks; and when sawn into planks the timber is put on shipboard, and carried to other districts where timber is wanted. Thus mechanical aid alone gives a value to the timber, and by so doing employs human labor. The stream that floats the tree, the sawing-mill that cuts it, the ship that carries it across the sea, enable men profitably to employ themselves in working it. Without the stream, the mill, and the ship, those men would have no labor, because none could afford to bring the timber to their own doors.

What an infinite variety of machines, in combination with the human hand, is found in a carpenter's chest of tools! The skillful hand of the workman is the *power* which sets these machines in motion; just as the wind or the water is the power of a mill, or the elastic force of vapor the power of a steam-engine. When Mr. Boulton, the partner of the great James Watt, waited upon George III. to explain one of the improvements of the steam-engine which they had effected, the king said to him, "What do you sell, Mr. Boulton?" and the honest engineer answered, "What kings, sire, are all fond of—*power*." There are people at the present time who let out *power*, that is, there are people who have steam-engines who will lend the use of them, by the day or the hour, to persons who require that saving of labor in their various trades; so that a person who wants the strength of a horse, or half a horse, to turn a wheel for grinding, or for setting a lathe in motion, hires a room, or part of a room, in a mill, and has just as much as he requires. The *power* of a carpenter is in his hand, and the machines moved by that power are in his chest of tools. Every tool which he possesses has for its object to reduce labor, to save material, and to insure accuracy—the objects of all machines. What a quantity of waste

both of time and stuff is saved by his foot-rule! and when he chalks a bit of string and stretches it from one end of a plank to the other, to jerk off the chalk from the string, and thus produce an unerring line upon the face of the plank, he makes a little machine which saves him great labor. Every one of his hundreds of tools, capable of application to a vast variety of purposes, is an invention to save labor. Without some tool the carpenter's work could not be done at all by the human hand. A knife would do very laboriously what is done very quickly by a hatchet. The labor of using a hatchet, and the material which it wastes, are saved twenty times over by the saw. But when the more delicate operations of carpentry are required—when the workman uses his planes, his molding tools, his chisels, his bevels, and his center-bits—what an infinitely greater quantity of labor is economized, and how beautifully that work is performed, which, without them, would be rough and imperfect! Every boy of mechanical ingenuity has tried with his knife to make a boat; and with a knife only it is the work of weeks. Give him a chisel, and a gouge, and a vice to hold his wood, and the little boat is the work of a day. Let a boy try to make a round wooden box, with a lid, having only his knife, and he must be expert indeed to produce any thing that will be neat and serviceable. Give him a lathe and chisels, and he will learn to make a tidy box in half an hour. Nothing but absolute necessity can render it expedient to use an imperfect tool instead of a perfect. We sometimes see exhibitions of carving, "all done with the common penknife." Professor Willis has truly said, with reference to such weak boasting, "So far from admiring, we should pity the vanity and folly of such a display; and the more, if the work should show a natural aptitude in the workman: for it is certain that, if he has

made good work with a bad tool, he would make better with a good one."

The German Emperor Maximilian, at the beginning of the sixteenth century, ordered a woodcut to be engraved that should represent the carpentry operations of his time and country. This prince was, no doubt, proud of the



CARPENTERS AND THEIR TOOLS. (FROM AN OLD GERMAN WOODCUT.)

advance of Germany in the useful arts. If the President of the United States were thus to record the advance of our republic, he would point to our saw-mills, our planing-mills, our machines for veneering, for turning gun-stocks, shoe-lasts, or for producing elaborate moldings and carvings. The German carpenters, as we see, are reducing a great slab of wood into shape by the saw and the adze. We now have planing-mills, with cutters that make 4000 revolutions, and which plane boards eighteen feet long at the rate of fifty feet per minute; and while the face of the board is planed, it is tongued and grooved at the

same time—that is, one board is made to fit closely into another.

Machinery has been applied in the United States to the working of wood to a greater extent than in any other country. Mr. Whitworth, the English Commissioner to the New York Exhibition in 1853, in his report on the mechanical novelties observed by him in this country, describes with particular interest the operations of the planing, tenoning, morticing, and jointing machines, all of which are comparatively unknown in Europe. In England, a paneled door is one of the most expensive fixtures of a house. In this country, however, by the aid of our labor-saving machines, twenty men can make paneled doors at the rate of a hundred per day—that is, one man can make five doors. The same is true, respecting the comparative cost of manufacturing window-frames, staircases, moldings, cornices, etc., in England and the United States. In the former country, they are mainly produced by hand-labor, in the latter, almost altogether by machinery. If doors and windows and staircases can be made cheaper, more houses and better houses will be built; and thus more carpenters will be employed in building than if those parts of a house were made by hand. The same principle applies to machines as to tools. If carpenters had not tools to make houses, there would be few houses made; and those that were made would be as rough as the hut of the savage who has no tools. The people would go without houses, and the carpenter would go without work—to say nothing of the people, who would also go without work, that now make tools for the carpenter.

Every invention that reduces the cost of a material, *i. e.*, makes it cheaper, increases the consumption, and consequently the demand for it. Bricks are every year used to a greater extent for the purposes of construction, in the

place of wood, because clay suitable for their preparation is found almost every where, while timber is gradually becoming scarcer and dearer.

Bricks, regarded as the production of a vast amount of labor, are intrinsically cheap, because they are made of what is truly machinery; the usual process differing but slightly from those adopted



EGYPTIAN BRICK-MAKING.

by the Egyptians three thousand years ago.

The clay is ground in a horse-mill; the wooden mold, in which every brick is made singly, is a copying machine. One brick is exactly like another brick. Every brick is of the form of the mold in which it is made. Without the mold the workman could not make the brick of uniform dimensions; and without this uniformity the after labor of putting bricks together would be greatly increased. Without the mold the workman could not form the bricks quickly; his own labor would be increased tenfold. The simple machine of the mold not only gives employment to a great many brickmakers who would not be employed at all, but also to a great many bricklayers who would also want employment if the original cost of production were so enormously increased. Within a few years a machine has been invented in the United States, which bids fair to greatly reduce the price of bricks, and at the same time manufacture them of superior quality. The clay used, enters the machine dry, and by means of a combination of rollers and sieves, is reduced to a uniform degree of fineness. The pulverized clay then passes into the press of the machine, where there are molds for six bricks, into which it falls, and imme-

diately is subjected to an immense pressure. This pressure gives it the shape and character of bricks directly, which are delivered from the machine upon a little frame so rapidly, that it requires the constant labor of two men to put the bricks into wheelbarrows. They are then conveyed directly to the kiln, without the necessity of any intermediate process whatever. The molds being exactly shaped, and made of metal, and the clay, being by the immense pressure brought to bear upon it, perfectly fitted to the molds; these unburnt bricks have a marble-like smoothness of surface, and are of exquisite accuracy of shape, altogether surpassing those made in the ordinary way. The number of bricks which one machine can thus make in an hour exceeds twenty-five hundred.

There is another material for building which was little used at the beginning of the century, viz., slate. The consumption of slate in London alone was, in 1851, from thirty thousand to forty thousand tons per annum. In the production of this one material, eight thousand quarriers are employed in Great Britain.

How great a variety of things are contained in a hardware store! Half the goods consist of tools of one sort or another to save labor; and the other half consists of articles of convenience or elegance most perfectly adapted to every possible want of the builder or the maker of furniture. The uncivilized man is delighted when he obtains a nail—any nail. A carpenter and joiner, who supply the wants of a highly civilized community, are not satisfied unless they have a choice of nails, from the finest brad to the largest spike. A savage thinks a nail will hold two pieces of wood together more completely than any thing else in the world. It is seldom, however, that he can afford to put it to such a use. If it is large enough, he makes it into a chisel. An American joiner knows that screws will do the work more

perfectly in some cases than any nail; and therefore we have as great a variety of screws as of nails. The commonest house built has hinges, and locks, and bolts. A great number are finished with ornamented knobs to door-handles, with bells and bell-pulls, and a thousand other things that have grown up into necessities, because they save domestic labor, and add to domestic comfort. And many of these things really are necessities. M. Say, a French writer, gives us an example of this; and as his story is an amusing one, besides having a moral, we may as well copy it:

"Being in the country," says he, "I had an example of one of those small losses which a family is exposed to through negligence. For the want of a latchet of small value, the wicket of a barn-yard leading to the fields was often left open. Every one who went through drew the door to: but as there was nothing to fasten the door with, it was always left flapping; sometimes open, and sometimes shut. So the cocks and hens, and the chickens, got out, and were lost. One day a fine pig got out, and ran off into the woods; and after the pig ran all the people about the place—the gardener, and the cook, and the dairymaid. The gardener first caught sight of the runaway, and, hastening after it, sprained his ankle; in consequence of which the poor man was not able to get out of the house again for a fortnight. The cook found, when she came back from pursuing the pig, that the linen she had left by the fire had fallen down and was burning; and the dairymaid having, in her haste, neglected to tie up one of her cows, the cow had kicked a colt, which was in the same stable, and broken its leg. The gardener's lost time was worth twenty crowns, to say nothing of the pain he suffered. The linen which was burned, and the colt which was spoiled, were worth as much more. Here, then, was caused a loss of forty crowns, as well as much trouble, plague, and vexation, for the want

of a latch which would not have cost threepence." M. Say's story is one of the many examples of the truth of the old proverb—"for want of a nail the shoe was lost, for want of a shoe the horse was lost, for want of a horse the man was lost."

Nearly all the great variety of articles in a hardware store are made by machinery. Without machinery they could not be made at all, or they would be sold at a price which would prevent them being commonly used. Some of the finer articles, such as a lock, could not be made at all, unless machinery had been called in to produce that wonderful accuracy, through which no one of a hundred thousand locks and keys shall be exactly like another lock and key. With machinery, the manufacture of hardware employs large numbers of artisans who would be otherwise unemployed. There are hundreds of ingenious men in New England who go into business with a capital acquired by their savings as workmen, for the purpose of manufacturing some one single article used in finishing a house, such as the knob of a lock, a screw, a hinge, or a window-fastener. All the heavy work of their trade is done by machinery. The cheapness of the article creates workmen; and the savings of the workmen accumulate capital to be expended in large works, and to employ more workmen.

The furniture of a house, some may say—the chairs, and tables, and bedsteads—is made nearly altogether by hand. True. But tools are machines; and further, we owe it to what men generally call machinery, that such furniture, even in the house of a very poor man, is more tasteful in its construction, and of finer material, than that possessed by a rich man a hundred years ago. How is this? Machinery (that is ships) has brought us much finer woods than we grow ourselves; and other machinery (the sawing-mill) has taught us how to render that fine wood very cheap, by

economising the use of it. At a veneering-mill, that is, a mill which cuts a mahogany log into thin plates, much more delicately and truly, and in infinitely less time, than they could be cut by the hand, two hundred and forty square feet of mahogany are cut by one circular saw in one hour. A veneer, or thin plate, is cut off a piece of mahogany, six feet six inches long, by twelve inches wide, in twenty-five seconds. What is the consequence of this? A mahogany table is made almost as cheap as a deal one; and thus the humblest family may have some article of mahogany, if it be only a work-stand. And let it not be said that pine furniture would afford as much happiness; for a desire for comfort, and even for some degree of elegance, gives a refinement to the character, and, in a certain degree, raises our self-respect. Diogenes, who is said to have lived in a tub, was a great philosopher; but it is not necessary to live in a tub to be wise and virtuous. Nor is that the likeliest plan for becoming so. The probability is, that a man will be more wise and virtuous in proportion as he strives to surround himself with the comforts and decent ornaments of his station.

It is a circumstance worthy to be borne in mind by all who seek the improvement of the people, that whatever raises not only the standard of comfort, but of taste, has direct effects of utility which might not at first be perceived. We will take the case of paper-hangings. Their very name shows that they were a substitute for the tapestry or hangings, of former times, which were suspended from the ceilings to cover the imperfections of the walls. This was the case in the house of the rich. The poor man in his hut had no such device, but must needs "patch a hole to keep the wind away." When paper-hangings were prepared and ornamented by hand, as they once were, their cost was very great, and in place of them many walls were daubed, or

stenciled over in rude patterns with paint. The paper-hangings themselves, when used, were not only expensive, but offensive to the eye, from their want of harmony in color and of beauty in design. The old papers remained on walls for years; and it was not till paper-hangings became cheap that the landlord or tenant of a small house thought of re-papering. The eye at length got offended by the dirty and ugly old paper. The walls were re-covered with neat patterns. But what had offended the eye had been prejudicial to the health. The old papers, that were saturated with damp from without and bad air from within, were recipients and holders of fever. When the bed-room became neat it also became healthful. The paper-hanger used to paste together yard after yard, made by hand at the paper-mill, and stamped by a block. The paper-machine which gave long rolls of paper enabled hangings to be printed by a cylinder as calico is now printed. The improvement of the manufacture by machinery, has now enabled every man to re-paper his room for almost as little as its whitewashing or coloring would cost him.

Look again at the carpet. Contrast it in all its varieties, from the gorgeous Persian to the neat Kidderminster, with the rushes of our forefathers, amid which the dogs hunted for the bones that had been thrown upon the floor. The clean rushes were a rare luxury, never thought of but upon some festive occasion. The carpet manufacture was little known in England at the beginning of the last century; as we may judge from our still calling one of the most commonly-woven English carpets by the name of "Brussels." The Scotch carpet is the cheapest of the produce of the carpet-loom; and it may be sufficient to show the connection of machinery with the commonest as well as the finest of these productions by an engraving of the loom. One of the most beautiful inventions of man, the Jacquard ap-

paratus (so called from the name of its inventor), is extensively used in every branch of the carpet manufacture.



SCOTCH CARPET-LOOM.

Let us see what mechanical ingenuity can effect in producing the most useful and ornamental articles of domestic life from the common earth which may be had for digging. Without chemical and mechanical skill we should neither have glass nor pottery; and without these articles how much lowered beneath his present station, in point of comfort and convenience, would be the humblest laborer in the land!

The cost of glass is almost wholly made up of the wages of labor, as the materials are very abundant, and may be

said to cost almost nothing ; and glass is much more easily worked than any other substance.

Hard and brittle as it is, it has only to be heated, and any form that the workman pleases may be given to it. It melts ; but when so hot as to be more susceptible of form than wax, or clay, or any thing else that we are acquainted with, it still retains a degree of toughness and capability of extension superior to that of many solids, and of every liquid ; when it has become red-hot all its brittleness is gone, and a man may do with it as he pleases. He may press it into a mold ; he may take a lump of it upon the end of an iron tube, and by blowing into the tube with his mouth (keeping the glass hot all the time), he may swell it out into a hollow ball. He may mold that ball into a bottle ; he may draw it out lengthways into a pipe ; he may cut it open into a cup ; he may open it with shears, whirl it round with the edge in the fire, and thus make it into a circular plate. He may also roll it out into sheets, and spin it into threads as fine as a cobweb. In short, so that he keeps it hot, and away from substances by which it may be destroyed, he can do with it just as he pleases. All this, too, may be done, and is done with large quantities every day, in less time than any one would take to give an account of it. In the time that the readiest speaker and clearest describer were telling how one quart bottle is made, an ordinary set of workmen would make some dozens of bottles.

But though the materials of glass are among the cheapest of all materials, and the substance the most obedient to the hand of the workman, there is a great deal of knowledge necessary before glass can be made. It can be made profitably only at large manufactories, and those manufactories must be kept constantly at work night and day.

As a natural product, glass can hardly be said to exist.

Among the various substances, however, which are thrown out by volcanoes, we sometimes find fused masses of earthy materials, which, in some respects, resemble impure glass, or coarse pottery. Rock, or quartz crystal, which resembles glass, is altogether a different substance. The sight of it, however, may possibly have suggested to men the idea of fabricating a similar substance by art. The fabrication of glass is of high antiquity. The historians of China, Japan, and Tartary speak of glass manufactories existing there more than two thousand years ago. Egyptian mummies, two or three thousand years old, are frequently found, which are ornamented with little fragments of colored glass. The writings of Seneca, a Roman author who lived about the time of our Saviour, and of St. Jerome, who lived five hundred years afterward, speak of glass being used in windows. It is recorded that the prior of a convent in Dorsetshire, England, in the year 674, sent for French workmen to glaze the windows of his chapel. In the twelfth century the art of making glass was known in England. Yet it is very doubtful whether glass was employed in windows, excepting those of churches and the houses of the very rich, for several centuries afterward; and it is quite certain that the period is comparatively recent, as we have shown, when glass windows were used for excluding cold and admitting light in the houses of the great body of the people, or that glass vessels were to be found among their ordinary conveniences. The manufacture of glass in England now employs twelve thousand people, because the article, being cheap, is of universal use.

Machinery, as we commonly understand the term, is not much employed in the manufacture of glass; but chemistry, which saves us as much labor as machinery, and performs work which no machinery could accomplish, is very largely employed.

The materials of which glass is composed, are sand and an alkali, either potash or soda. To these ingredients are generally added an oxyd of lead, called litharge, or red-lead, a little lime, and, for colored glass, various metallic compounds. Sand suitable for the manufacture of the nicest varieties of glass, was formerly obtained with great difficulty. Ordinary sand contains iron, which imparts a color to the glass. Sand was even sent to England from Australia, and to New England from Florida. Within a few years, the finest glass sand has been discovered in Berkshire county, Massachusetts, and from this source nearly all manufactories of nice glass in the world are now supplied. The various materials which enter into the composition of glass, are mixed together and subjected to an intense heat, in a peculiarly-constructed furnace. It requires a red heat of sixty hours to prepare the material of a common bottle. Nearly all glass, except glass for mirrors, is what is called blown. The machinery is very simple, consisting only of an iron pipe and the lungs of the workman; and the process is perfected in all its stages by great subdivision of labor, producing extreme neatness and quickness in all persons employed in it. For instance, a wine-glass is made thus: One man (the blower) takes up the proper quantity of glass on his pipe, and blows it to the size wanted for the bowl; then he whirls it round on a reel, and draws out the stalk. Another man (the footer) blows a smaller and thicker ball, sticks it to the end of the stalk of the blower's glass, and breaks his pipe from it. The blower opens that ball, and whirls the whole round till the foot is formed. Then a boy dips a small rod in the glass-pot, and sticks it to the very center of the foot. The blower, still turning the glass round, takes a bit of iron, wets it in his mouth, and touches the ball at the place where he wishes the mouth of the glass to be. The glass separates, and the boy takes it to the finisher, who turns the mouth of it; and,

by a peculiar swing that he gives it round his head, makes it perfectly circular, at the same time that it is so hardened as to be easily snapped from the rod. Lastly, the boy takes it on a forked iron to the annealing furnace, where it is cooled gradually.

All these operations require the greatest nicety in the workmen; and would take a long time in the performance, and not be very neatly done after all, if they were all done by one man. But the quickness with which they are done by the division of labor is perfectly wonderful.

The cheapness of glass for common use, which cheapness is produced by chemical knowledge and the division of labor, has set the ingenuity of man to work to give greater beauty to glass as an article of luxury. The employment of sharp-grinding wheels, put in motion by a treadle, and used in conjunction with a very nice hand, produces *cut* glass. Cut glass is now comparatively so cheap, that scarcely a family of the middle ranks is without some beautiful article of this manufacture.

Ordinary drinking-glasses, lamps, etc., are made in imitation of cut glass, by subjecting a portion of the melted glass to pressure in a mold. Articles of great beauty, but of a less cost, closely resembling cut glass, are made in this manner.

The reduction of the cost of the manufacture of glass has had the effect of improving the architecture of our houses to a very great degree. We have now plate-glass of the largest dimensions, giving light and beauty to our shops; and sheet-glass, nearly as effective as plate, adorning our private dwellings. Sheet-glass, in the making of which an amount of ingenuity is exercised which would have been thought impossible in the early stages of glass-making, is doing for the ordinary purposes of building what plate-glass did formerly for the rich. A portion of melted glass, weighing twelve or fourteen pounds, is, by the exercise of thi

skill, converted into a ball, and then into a cylinder, and then into a flat plate; and thus two crystal palaces have been built in England, which have consumed as much glass, weight by weight, as was required for all the houses in one fourth of the area of Great Britain in the beginning of the century.

“Thus the use of glass in our windows, instead of the shutters of our ancestors, has introduced comfort into the meanest dwelling, which did not formerly belong to the richest palace. By means of this contrivance, the light is filtered from the wind, the rain, and the cold; we can enjoy the one without being inconvenienced by the others; and we can, in conjunction with our method of warming, create an in-door climate adapted to our feelings and desires. The use of glass in many of our domestic articles of furniture and vessels, contributes to cleanliness and health, for the slightest soil upon our glasses and decanters is revealed by this most transparent material, and the purity of water and other liquids contained in them, is physically tested by the same means. Even the mirror which adorns our rooms, reminds us of the necessary attention to personal appearance, which self-respect, as well as respect for society demands. By means of glass the eye of advancing age regains something of its youthful vigor. By means of glass the astronomer makes us acquainted with distant worlds, and the microscopist with the inhabitants of a drop of water. By means of glass the physicist has discovered the physical properties of the atmosphere, and the chemist its equally wonderful chemical properties. Indeed, science is greatly indebted for its progress to the convenient chambers of glass of every variety of shape and form, so easily and so cheaply procured, within whose transparent walls processes can be isolated and watched without danger to the operator. The whole of pneumatic chemistry depends on glass; as does

also the existence of most chemical acids and mineral reagents, which could never have been discovered, or if discovered, preserved for any length of time, but for glass retorts and glass bottles."

There are two kinds of pottery—common potters' ware and porcelain. The first is a pure kind of brick, and the second a mixture of very fine brick and glass. Almost all nations have some knowledge of pottery; and those of the very hot countries are sometimes satisfied with dishes formed by their fingers without any tool, and dried by the heat of the sun. In all countries, however, good pottery must be baked or burned in a kiln of some kind or other.

Vessels for holding meat and drink are almost as indispensable as the meat and drink themselves; and the two qualities in them that are most valuable are, that they shall be cheap and easily cleaned. Pottery, as it is now produced, possesses both of these qualities in the very highest degree. A white basin, having all the useful properties of the most costly vessels, may be purchased for a few cents in any village in the United States. There are very few substances used in human food that have any effect upon these vessels; and it only requires rinsing them in hot water, and wiping them with a cloth, and they are clean.

The making of an earthen bowl would be to a man who made a first attempt no easy matter. Let us see how it is done so that it can be carried to remote districts and sold for a few cents, and yet leave a profit to the maker and the wholesale and retail dealer.

The cheapest varieties of pottery, such as flower-pots, etc., are made of common clay, similar to that of which bricks are formed, and which, from the iron it contains, usually turns red in burning. Next to this is the common crockery ware, formed of the purer and whiter clays, in which only exists in minute quantities. Porcelain, white

most expensive and beautiful of all the varieties of pottery, is formed only from the purest and most delicate clays, united with finely powdered flint; this last melting with the clay, when the two are exposed to intense heat, vitrifies and gives to the mass a semi-transparent appearance.

In the manufacture of porcelain, the clay is worked in water by various machinery till it contains no single piece large enough to be visible to the eye. It is like cream in consistence. The flints are burned. They are first ground in a mill, and then worked in water in the same manner as the clay, the large pieces being returned a second time to the mill.

When both are fine enough, one part of flint is mixed with five or six of clay; the whole is worked to a paste; after which it is kneaded either by the hands or a machine; and when the kneading is completed, it is ready for the potter.

He has a little wheel which lies horizontally. He lays a portion of clay on the center of the wheel, puts one hand, or finger if the vessel is to be a small one, in the middle, and his other hand on the outside, and, as the wheel turns rapidly round, draws up a hollow vessel in an instant. With his hands, or with very simple tools, he brings it to the shape he wishes, cuts it from the wheel with a wire, and a boy carries it off. The potter makes vessel after vessel, as fast as they can be carried away.

The potter's wheel is an instrument of the highest antiquity. In the book of Ecclesiasticus we read—"So doth the potter, sitting at his work, and turning the wheel about with his feet, who is always carefully set at his work, and maketh all his work by number: he fashioneth the clay with his arm, and boweth down his strength before his feet; he applieth himself to lead it over, and is diligent to make clean the furnace."—(c. xxxix. v. 29, 30.) At the

present day the oriental potter stands in a pit, in which the lower machinery of his wheel is placed. He works as the potter of the ancient Hebrews.



POTTER'S WHEEL OF MODERN EGYPT.

As the potter produces the vessels they are partially dried, after which they are turned on a lathe and smoothed with a wet sponge when necessary. Only round vessels can be made on the wheel; those of other shapes are made

in molds of plaster. Handles and other solid parts are pressed in molds, and stuck on while they and the vessels are still wet.

The vessels thus formed are first dried in a stove, and, when dry, burned in a kiln. They are in this state called biscuit. If they are finished white, they are glazed by another process. If they are figured, the patterns are engraved on copper, and printed on coarse paper rubbed with soft soap. The ink is made of some color that will stand the fire, ground with earthy matter. These patterns are moistened and applied to the porous biscuit, which absorbs the color, and the paper is washed off, leaving the pattern on the biscuit.

The employment of machinery to do all the heavy part of the work, the division of labor, by which each workman acquires wonderful dexterity in his department, and the conducting of the whole upon a large scale, give bread to a vast number of people, make the pottery cheap, and enable it to be sold at a profit in almost every market in the world. It is not ninety years since the first pottery of a good quality was extensively made in England; and before that time what was used in England and the United States was imported—the common ware from Delf, in Holland (from which it acquired its name), and the porcelain from China.

The history of the manufacture of porcelain affords us two examples of persevering ingenuity—of intense devotion to one object—which have few parallels in what some may consider the higher walks of art. Palissy and Wedgwood are names that ought to be venerated by every artisan. The one bestowed upon France her manufacture of porcelain, so long the almost exclusive admiration of the wealthy and the tasteful. The other gave to England her more extensive production of earthenware, combining with great cheapness the imitation of the most beautiful forms.

of ancient art. The potteries of England may be almost said to have been created by Josiah Wedgwood. In his workshops we may trace the commencement of a system of improved design which made his ware so superior to any other that had been produced in Europe for common uses. In other branches of manufacture this system found few imitators; and we were too long contented, in our textile fabrics especially, with patterns that were unequalled for ugliness—miserable imitations of foreign goods, or combinations of form and color outraging every principle of art. We have seen higher things attempted in the present day; but for the greater part of a century the porcelain articles of England were the only attempts made in that country to show that taste was as valuable a quality in association with the various articles which are required for domestic use, as good materials and clean workmanship. It was long before manufacturers and merchants discovered that taste had an appreciable commercial value.

We think that, with regard to buildings and the furniture of buildings, it will be admitted that machinery, in the largest sense of the word, has increased the means of every man to procure a shelter from the elements, and to give him a multitude of conveniences within that shelter. Most will agree that a greater number of persons are profitably employed in affording this shelter and these conveniences, with tools and machines, than if they possessed no such mechanical aids to their industry.

CHAPTER XVII.

DWELLINGS OF THE PEOPLE.—OBERLIN.—THE HIGHLANDER'S CANDLESTICKS.—
SUPPLY OF WATER.—LONDON WATER-WORKS.—STREET-LIGHTS.—SEWERS.

It is satisfactory to observe that the increase of houses both in the United States and Great Britain, has kept pace with the population. In 1801, in Great Britain, there was a population of 10,500,000 persons, and 1,800,000 inhabited houses. In 1851, there were 20,800,000 persons, and 3,800,000 inhabited houses. The numbers in each case had, as nearly as may be, doubled. Analogous facts have also been observed in the United States—the population of our country being supplied with houses almost in the precise ratio as is the population of Great Britain. Thus the total population of the United States, by the census of 1850, was 23,263,000, or 20,059,000 free persons. The number of houses occupied at the same time by free persons was 3,363,427. The ratio of increase during the past fifty years, between the population and the number of houses, has been somewhat greater in the United States than in Great Britain.

But it is not equally satisfactory to know that the improvement in the quality of the houses in Great Britain and to some extent in the United States, in which the great body of those who labor for wages abide, is not commensurate with the increase in their quantity. It is not fitting that, while the general progress of science is raising, as unquestionably it is raising, the average condition of the whole

people—and that while education is going forward, numbers of those so progressing should be below their proper standard of physical comfort, from the too common want of decent houses to surround them with the sanctities of home.*

In the great business of the improvement of their dwellings the working men require leaders—not demagogues, whose business is to subvert, and not to build up—but leaders like the noble pastor, Oberlin, who converted a barren district into a fruitful, by the example of his unremitting energy. This district was cut off from the rest of the world by the want of roads. Close at hand was Strasburg, full of all the conveniences of social life. There was no money to make roads, but there was abundant power of labor. There were rocks to be blasted, embankments to be raised, bridges to be built. The undaunted clergyman took a pickax, and went to work himself. He worked alone till the people were ashamed of seeing him so work. They came at last to perceive that the thing was to be done, and that it was worth the doing. In three years the road was made. If there were an Oberlin to lead the inhabitants of every filthy street, and the families of every wretched house, to their own proper work of improvement, a terrible evil would be soon removed, which is as great an impediment to the productive powers of a

* In reference to the general character of the houses of the American people, the compiler of the census of 1850 remarks: "While our country can not boast the princely residences of European countries, the occupancy of which is limited to comparatively few persons, we think there is a general sufficiency and comfort in the house accommodations of the American people; and that, in the most remote regions of our country, where their accommodations are most limited, they exhibit a very satisfactory degree of comfort and cleanliness. The fact is notorious that where wretchedness is at all general, there will be found a population which formed habits and imbibed tastes in a foreign land.

country, and, therefore, to the happiness of its people, as the want of ready communication, or any other appliance of civilization. The enormity of the evil would be appalling, if the capability of its removal in some degree were not equally certain.

Whatever a government may attempt—whatever municipalities or benevolent associations—there can be nothing so effectual in the upholding to a proper mark the domestic comfort of the working men of this country, as their firm resolve to uphold themselves.

Still, unhappily, it is an undoubted fact that many industrious men in large cities are too often unable to procure a fit dwelling, however able to pay for it and desirous to procure it. The houses have been built with no reference to such increasing wants. The idle and the diligent, the profligate and the prudent, the criminal and the honest, the diseased and the healthful, are therefore thrust into close neighborhood. There is no escape. Is this terrible evil incapable of remedy? To discover that remedy, and apply it, is truly a national concern; for assuredly there is no capital of a country so worth preserving in the highest state of efficiency as the capital it possesses in an industrious population. There is a noble moral in a passage of Scott's romance—"The Legend of Montrose." A Highland chief had betted with a more luxurious English baronet whom he had visited that he had better candlesticks at home than the six silver ones which the richer man had put upon his dinner-table. The Englishman went to the chief's castle in the hills, where the owner was miserable about the issue of his bragging bet. But his brother had a device which saved the honor of the clan. The attendant announced that the dinner was ready, and the candles lighted. Behind each chair for the guests stood a gigantic Highlander with his drawn sword in his right hand, and a blazing torch in his

left, made of the bog-pine; and the brother exclaimed to the startled company—"Would you dare to compare to THEM in value the richest ore that ever was dug out of the mine?"

We may naturally pass from these considerations to a most important branch of the great subject of the expenditure of capital for public objects.

The people who live in small villages, or in scattered habitations in the country, have certainly not so many *direct* benefits from machinery as the inhabitants of towns. They have the articles at a cheap rate which the machines produce, but there are not so many machines at work for them as for dense populations. From want of knowledge they may be unable to perceive the connection between a cheap coat, or a cheap tool, and the machines which make them plentiful and, therefore, cheap. But even they, when the saving of labor by a machine is a saving which immediately affects them, are not slow to acknowledge the benefits they derive from that best of economy. The Scriptures allude to the painful condition of the "hewers of wood" and the "drawers of water;" and certainly, in a state of society where there are no machines at all, or very rude machines, to cut down a tree and cleave it into logs, and to raise a bucket from a well, are very laborious occupations, the existence of which, to any extent, among a people, would mark them as remaining in a wretched condition. Immediately that the people have the simplest mechanical contrivance, such as the loaded lever, to raise water from a well, which is found represented in Egyptian sculpture, and also in our Anglo-Saxon drawings, they are advancing to the condition of raising water by machinery. The Oriental *shadoof* is a machine. In our own country, at the present day, there are not many houses, in situations where water is at hand, that have not the windlass, or what is better, the

pump, to raise this great necessary of life from the well. Some laborers, however, have no such machines, and hit-



THE EGYPTIAN SHADOOF.

terly do they lament the want of them. We once met an old woman in a country district tottering under the weight of a bucket, which she was laboring to carry up a hill. We

asked her how she and her family were off in the world. She replied that she could do pretty well with them, for they could all work, if it were not for one thing—it was one person's labor to fetch water from the spring; but, said she, if we had a pump handy, we should not have much to complain of. This old woman very wisely had no love of labor for its own sake; she saw no advantage in the labor of one of her family being given for the attainment of a good which she knew might be attained by a very common invention. She wanted a machine to save that labor. Such a machine would have set at liberty a certain quantity of labor which was previously employed unprofitably; in other words, it would have left her or her children more time for more profitable work, and then the family earnings would have been increased.

But there is another point of view in which this machine would have benefited the good woman and her family. Water is not only necessary to drink and to prepare food with, but it is necessary for cleanliness, and cleanliness is necessary for health. If there is a scarcity of water, or if it requires a great deal of labor to obtain it (which comes to the same thing as a scarcity), the uses of water for cleanliness will be wholly or in part neglected. If the neglect becomes a habit, which it is sure to do, disease, and that of the worst sort, can not be prevented.

When men gather together in large bodies, and inhabit towns or cities, a plentiful supply of water is the first thing to which they direct their attention. If towns are built in situations where pure water can not be readily obtained, the inhabitants, and especially the poorer sort, suffer even more misery than results from the want of bread or clothes. In some cities of Spain, for instance, where the people understand very little about machinery, water, at particular periods of the year, is as dear as wine; and the la-

boring classes are consequently in a most miserable condition. In London, on the contrary, as it appears from a return of the various water companies, the daily average of water-supply is sixty-two million gallons, being an average of about two hundred and two gallons to each house and other buildings, which amount to three hundred and ten thousand. This seems an enormous supply, but in proportion to the population it is much less than the daily quantity of water supplied to the cities of New York, Boston, or Philadelphia. London with a population in 1850 of two million three hundred and sixty-thousand, has a daily water-supply of sixty-two million gallons, while New York with a population about five hundred thousand, receives daily from the Croton water-works sixty million gallons. Even this quantity, so much greater than that supplied to the population of London, is not deemed sufficient for the wants of New York, and there are reasons for thinking that the quantity ought to be increased, and the arrangements made so perfect, that there should be a perpetual stream of water through the pipes of each house, like that through the arteries from the heart. These arrangements are wondrous when compared with the water-supply of other times; and it is satisfactory to know that there are very few of our large towns which are not supplied as well as, and many much better than, London. The cost of the water-supply to the inhabitants of our large cities, the quantity consumed being taken into consideration, is also exceedingly cheap. In Boston the supply for every dwelling-house occupied by one family is rated at five dollars per annum; for manufacturing establishments using two hundred gallons or less per day, six cents per hundred gallons; and for establishments using from two thousand to ten thousand gallons per day, three cents per hundred gallons. In some places the cost of water is even much less than this, but

for the large cities the tariff of prices is generally about the same. In London and in most large cities, great difficulties have been experienced in supplying water, on account of the unexampled increase in the population.

The sanitary arrangements of our great towns—the supply of water, the drainage—have followed the growth of the population and not preceded it. As the necessity has arisen for such a ministration to the absolute wants of a community, it has inevitably become a system of expedients. We are wiser now when we build upon new ground. We first construct our lines of street, with sewers, and water-pipes, and gas-pipes, and then we build our houses. What a different affair is it to manage these matters effectually when the houses have been previously built with very slight reference to such conditions of social existence!

As long ago as the year 1236, when a great want of water was felt in London, the little springs being blocked up and covered over by buildings, the ruling men of the city caused water to be brought from Tyburn, which was then a distant village, by means of pipes; and they laid a tax upon particular branches of trade to pay the expense of this great blessing to all. In succeeding times more pipes and conduits, that is, more machinery, were established for the same good purpose; and two centuries afterward, King Henry the Sixth gave his aid to the same sort of works, in granting particular advantages in obtaining lead for making pipes. The reason for this aid to such works was, as the royal decree set forth, that they were “for the common utility and decency of all the city, and *for the universal advantage*,” and a very true reason this was. As this London more and more increased, more water-works were found necessary; till at last, in the reign of James the First, which was nearly two hundred years

after that of Henry the Sixth, a most ingenious and enterprising man, Hugh Myddleton, undertook to bring a river of pure water above thirty-eight miles out of its natural course, for the supply of London. He persevered in this immense undertaking, in spite of every difficulty, till he at last accomplished that great good which he had proposed, of bringing wholesome water to every man's door. At the present time, the New River, which was the work of Hugh Myddleton, supplies London with more than seventeen millions of gallons of water every day; and though the original projector was ruined by the undertaking, in consequence of the difficulty which he had in procuring proper support, such is now the general conviction of the advantage which he procured for his fellow-citizens, and so desirous are the people to possess that advantage, that a share in the New River Company, which was at first sold at one hundred pounds, is now worth three thousand pounds.

Before the people of London had water brought to their own doors, and even into their very houses, and into every room of their houses where it is desirable to bring it, they were obliged to send for this great article of life—first, to the few springs which were found in the city and its neighborhood, and, secondly, to the conduits and fountains, which were imperfect mechanical contrivances for bringing it.

When the inhabitants carried their water from the springs and conduits there was a great deal of human labor employed; and as in every large community there are always people ready to perform labor for money, many persons obtained a living by carrying water about in London for sale, as they do to this day in many of the Eastern cities. When the New River had been dug, and the pipes had been laid down, it is perfectly clear that there would have been no further need for these water-carriers. When



WATER-CARRIERS OF TURKEY.

the people of London could obtain two hundred gallons of water for two cents, they would not employ a man to fetch a single bucket from the river or fountain at the same price. They would not, for the mere love of employing human labor directly, continue to buy an article very dear, which, by mechanical aid, they could buy very cheap. If they had resolved, from any mistaken notions about machinery, to continue to employ the water-carriers, they must have been contented with one gallon of water a day instead of two hundred gallons. Or if they had consumed a larger quantity, and continued to pay the price of bringing it to them by hand, they must have denied themselves other necessities and comforts. They must have gone without a certain portion of food, or clothing, or fuel, which they are now enabled to obtain by the saving in the article of water. To have had for each house two hundred gallons of water, and, in having this two hundred gallons of water, to have had the cleanliness and health which result from its use, would have been utterly impossible. The supply of one gallon, instead of two hundred gallons to each house, would at present amount to 310,000 gallons daily, which, at one cent per gallon, would cost \$3,100 per day; or \$21,700 per week; or more than \$1,000,000 per annum. On the assumption that one man, without any mechanical arrangements besides his can, could carry twenty gallons a day, thus earning in seven days one dollar and forty cents, this would employ no fewer than 15,000 persons—a very army of water-carriers. To supply ten gallons a day to each house would cost more than \$11,000,000 per annum, and would employ more than 150,000 persons. To supply two hundred gallons a day would require 3,614,800 persons—a number exceeding the total population of London. The whole number of persons engaged in the water-works' service of all Great Britain is under 1000.

There is now, certainly, no labor to be performed by water-carriers. But suppose that five hundred years ago, when there were a small number of persons who gained their living by such drudgery, they had determined to prevent the bringing of water by pipes into London. Suppose also that they had succeeded; and that up to the present day we had no pipes or other mechanical aids for supplying the water. It is quite evident that if this misfortune had happened—if the welfare of the many had been retarded (for it never could have been finally stopped) by the ignorance of the few—London, as we have already shown, would not have had a twentieth part of its present population; and the population of every other town, depending as population does upon the increase of *profitable* labor, could never have gone forward. How then would the case have stood as to the amount of labor engaged in the supply of water? A few hundred, at the utmost a few thousand, carriers of water would have been employed while the smelters and founders of iron of which water-pipes are made, the laborers who lay down these pipes, the founders of lead who make the service-pipes, and the plumbers who apply them; the carriers, whether by water or land, who are engaged in bringing them to the towns—these, and many other laborers and mechanics who directly and indirectly contribute to the same public advantage, could never have been called into employment. To have continued to use the power of the water-carriers would have rendered the commodity two hundred times dearer than it is supplied by mechanical power. The present cheapness of production, by mechanical power, supplies employment to an infinitely greater number of persons than could have been required by a perseverance in the rude and wasteful system which belonged to former ages of ignorance and wretchedness.

When society is more perfectly organized than it is at

present, and when the great body of the people understand the value of co-operation for procuring advantages that individuals can not attain, public baths will be established in every town, and in every district of a town. The great Roman people had public baths for all ranks. The great American people have only thought within these few years that a few public baths were a necessity. The establishment of public wash-houses, in connection with baths, having every advantage of machinery and economical arrangements, are real blessings to the few who now use them.

It is little more than thirty years since London was lighted with gas. One of the principal streets was thus lighted in 1807, by a chartered company, to whose claims for support the majority of householders were utterly opposed. They had their old oil-lamps, which were thought absolute perfection. The main pipes which convey gas to the London houses are now fifteen hundred miles in length. The noblest prospect in the world is a large city lighted with gas, seen from an elevation on a bright winter's evening. The stars are shining in heaven, but there are thousands of earthly stars glittering in the city there spread before us; and as we look into any small space of that wondrous illumination, we can trace long lines of light losing themselves in the general splendor of the distance, and we can see dim shapes of mighty buildings afar off, showing their dark masses amid the glowing atmosphere that hangs over the city for miles, with the edges of flickering clouds gilded as if they were touched by the first sunlight. This is a spectacle that men look not upon, because it is common; and so we walk amid the nightly splendors of the streets, and forget what it was in the middle of the last century—the days of “darkness visible,” under the combined efforts of the twinkling lamp, the watchman's lantern, and the vagabond's link.

The last, but in many respects one of the most useful of public works to which a large amount of capital has been devoted, is the construction of sewers in our cities and towns. Popular intelligence and official power have been very slowly awakened to the performance of this duty. And yet the consequences of neglect have been felt for centuries. In 1290 the monks of White Friars and of Black Friars in London, complained to the king that the exhalations from the Fleet River overcame the pleasant odor of the frankincense which burned on their altars, and occasioned the deaths of the brethren. This was the polluted stream that in time came to be known as Fleet Ditch, which Pope described as

"The king of dykes, than whom no sluice of mud
With deeper sable blots the silver flood."

Fleet Ditch became such a nuisance that it was partly filled up by act of parliament soon after these lines were written. The Londoners had then their reservoirs of filth, called laystalls, in various parts near the river; and the pestilent accumulations spread disease all over the city. The system of sewers was begun in 1756, and from that time to the present several hundreds of miles of sewers have been constructed in London. At the present time every large town or city properly organized, has its system of sewerage. Public opinion in this matter, has gone so strongly in the direction of a thorough reformation, that these arrangements, so essential to health and cleanliness, can no longer be neglected. Experience has taught us by bitter and expensive lessons that every dollar of public capital so expended is a certain addition to the total amount of national wealth. Apart, however, from mere temporal or pecuniary consideration, every thing connected with those departments of sanitary reform which have for their object the

removal of filth, or impurity, or the abatement of nuisances, has special claims upon our attention, and should be regarded as duties which we have no right to ignore, or neglect, since as John Wesley remarked, "cleanliness is second only to godliness." "When the missionary Van der Kemp, was setting out for Africa, passing one of the brick-yards of London, he thought it would be such a boon to the Hottentots if he could improve their dwellings, that he offered himself as a servant to the brick-maker, and spent some weeks in learning the business. And he was right. It is not easy to live godly and righteously amid filth and darkness; and although the Gospel will not refuse to enter a Hottentot hut, or an Irish cabin, when once it is admitted, its tendency is to improve that cabin, or hut into a cottage with tiles on the floor, and glass in the windows."

CHAPTER XVIII.

EARLY INTERCOURSE WITH FOREIGN NATIONS.—PROGRESS OF THE COTTON MANUFACTURE.—HAND-SPINNING.—ARKEWRIGHT.—CROMPTON, WHITNEY AND THE COTTON-GIN.—PROGRESS OF THE COTTON MANUFACTURE IN AMERICA.—ESPECIAL BENEFITS OF MACHINERY IN THIS MANUFACTURE.

THERE was a time when the people of England were very inferior to those of the Low Countries, of France, and of Germany, in various productions of manufacturing industry. What first gave an impulse to the woolen trade, which for several centuries was the great staple of England, was the procuring foreign workmen to teach the English people their craft. Before that period the nations on the Continent had a proverb against the English. They said, "the stranger buys of the Englishman the skin of the fox for a groat, and sells him the tail for a shilling." The proverb meant that the people of England had not skill to convert the raw material into an article of use, and that they paid a large price for the labor and ingenuity which made their native material available to themselves.

But still the intercourse, such as it was then, with "the stranger" was better than no intercourse. They gave the rough and stinking fox's skin for a groat, and received the nicely dressed tippet for a shilling. The next best thing to dressing the skin themselves was to pay other people for dressing it. Without foreign communication the English could not have got that article of clothing at all.

All nations that have made any considerable advance in civilization have been commercial nations. The arts of life are very imperfectly understood in countries which have little communication with the rest of the world, and consequently the inhabitants are poor and wretched ; their condition is not bettered by the exchange with other countries, either of goods or of knowledge. They have the fox's skin, but they do not know how to convert it into value, by being furriers themselves, or by communication with "stranger" furriers.

The people of the East, among whom a certain degree of civilization has existed from high antiquity, were not only the growers of many productions which were unsuited to the climate and soil of Europe, but they were the manufacturers also. Cotton, for instance was cultivated from time



MICROSCOPIC APPEARANCE OF THE COTTON FIBER.

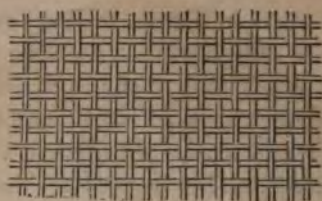
immemorial in Hindoostan, in China, in Persia, and in Egypt. Cotton was a material easily grown and collected ; and the patient industry of the people by whom it was cultivated, their simple habits, and their few wants, enabled them to send into Europe their manufactured stuffs of a fine and dura-

ble quality, under every disadvantage of land-carriage, even from the time of the ancient Greeks. Before the discovery, however, of the passage of India by the Cape of Good Hope, cotton goods in Europe were articles of great price and luxury. M. Say well observes that, although cotton stuffs were cheaper than silk (which was formerly sold for its weight in gold), they were still articles which could only be purchased by the most opulent; and that, if a Grecian lady could awake from her sleep of two thousand years, her astonishment would be unbounded to see a simple country girl clothed with a gown of printed cotton, a muslin kerchief, and a colored shawl.

When India was open to the ships of Europe, the Portuguese, the Dutch, and the English sold cotton goods in every market, in considerable quantities. These stuffs bore their Indian names of calicoes and muslins; and, whether bleached or dyed, were equally valued as among the most useful and ornamental articles of European dress.

In the seventeenth century France began to manufacture into stuffs the *raw* cotton imported from India, as Italy had done a century before. A cruel act of despotism drove the best French workmen, who were Protestants, into England, and Englishmen learned the manufacture. The same act of despotism, the revocation of the Edict of Nantes, caused the settlement of silk manufacturers in England. The English did not make any considerable progress in the art, nor did they use the material of cotton exclusively in making up the goods. The warp, or longitudinal threads of the cloth, were of flax, the weft only was of cotton; for they could not twist it hard enough by hand to serve both purposes. The accompanying figures are enlarged representations of a piece of cotton cloth, showing the position and distinctions of the warp and weft; the longitudinal lines (represented in the lower figure by dots) constituting the warp, and the lines at

right angles, or running across the figure, the weft. This weft was spun entirely by hand with a distaff and spindle—



the same process in which the women of England had been engaged for centuries—and which we see represented in ancient drawings. The manufacture, in spite of all these disadvantages, continued to increase; so that about 1760, although there were fifty thousand spindles at work in the county of Lancashire alone, the weaver found the greatest difficulty in procuring a sufficient supply of thread. Neither weaving nor spinning was then carried on in large factories. They were domestic occupations. The women of a family worked at the distaff or the hand-wheel, and there were two operations necessary in this department; roving, or coarse spinning, reduced the carded cotton to the thickness of a quill, and the spinner afterward drew out and twisted the roving into weft fine enough for the weaver. The spinsters of England were carrying on the same operation as the spinsters of India. In the middle of the last century, according to Mr. Guest, a writer on the cotton manufacture, very few English weavers could procure weft enough to keep themselves constantly employed. "It was no uncommon thing," he says, "for a weaver to walk three or four miles in a morning, and call on five or six spinners, before he could collect weft to serve him for the remainder of the day; and when he wished to weave a piece in a shorter time than

usual, a new ribbon or gown was necessary to quicken the exertions of the spinner."



DISTAFF.

That the manufacture should have flourished in England at all under these difficulties is honorable to the industry of that country; for the machinery used in weaving was also of the rudest sort, so that, if the web was more than three feet wide, the labor of two men was necessary to throw the shuttle. English cotton goods, of course, were very dear, and there was little variety in them. The cloth made of flax and cotton was called fustian; for which article Manchester was famous, as well as for laces. England, however, still received the calicoes and printed cottons from India.

In a country where men have learned to think, and where ingenuity therefore is at work, a deficiency in material or

in labor to meet the demand of a market is sure to call forth invention. It is a century ago since it was perceived that spinning by machinery might give the supply which human labor was inadequate to produce, because, doubtless, the remuneration for that labor was very small. The work of the distaff, as it was carried on at that period, in districts partly agricultural and partly commercial, was, generally, an employment for the spare hours of the young women, and the easy industry of the old. It was a labor that was to assist in maintaining the family; not a complete means for their maintenance. The supply of yarn was, therefore, insufficient, and ingenious men applied themselves to remedy that insufficiency. Spinning-mills were built in England in 1733, in which, it is said, although we have no precise account of it, that an apparatus for spinning was erected. A Mr. Lawrence Earnshaw is recorded to have invented a machine in 1753, to spin and reel cotton at one operation; which he showed to his neighbors and then destroyed it, through the generous apprehension that he might deprive the poor of bread. We must admire the motive of this good man, although we are now enabled to show that his judgment was mistaken. Richard Arkwright, a barber of England, invented in 1769, the principal part of the machinery for spinning cotton, and by so doing he gave bread to millions of people instead of a few thousands, and, assisted by subsequent inventions, raised the importation of cotton into England from less than two million pounds per annum to a thousand million pounds; enabling Great Britain to supply other nations with cotton manufactures to the enormous amount of thirty-three million pounds sterling in one year, 1853.

And how did Arkwright effect this great revolution? He asked himself whether it was not possible, instead of a wheel which spins a single thread of cotton at a time, and

by means of which the spinner could obtain in twenty-four hours about two ounces of thread—whether it might not be possible to spin the same material upon a great number of wheels, from which many hundreds of threads might issue at the same moment. The difficulty was in giving to these numerous wheels, spinning so many threads, the peculiar action of two hands when they pinch, at a little distance from each other, a lock of cotton, rendering it finer as it is drawn out. It was necessary, also, at the same time, to imitate the action of the spindle, which twisted together the filaments at the moment they had attained the necessary degree of fineness. It would be extremely difficult, if not impossible, to give an adequate idea, by words, of the complex machinery by which Arkwright accomplished his object. He is said to have received the first idea of the construction of his machine from seeing a red-hot bar of iron elongated by being passed between heavy rollers. Since Arkwright's time prodigious improvements have been made in the machinery for cotton-spinning; but the principle remains the same, namely, to enable rollers to do the work of human fingers, with much greater precision, and incomparably cheaper. We will attempt briefly to describe this chief portion of the great invention.

We must suppose that, by the previous operation of carding, the cotton-fiber has been so combed and prepared as to be formed into a long untwisted line of about the thickness of a man's finger. This line so formed (after it has been introduced into the spinning-machine) is called a *roving*, the old name in hand-spinning.

In order to convert this roving into a thread, it is necessary that the fibers, which are for the most part curled up, and which lie in all directions, should be stretched out and laid lengthwise, side by side; that they should be pressed together so as to give them a more compact form; and that

they should be twisted, so as to unite them all firmly together. In the original method of spinning by the distaff, these operations were performed by the finger and thumb, and they were afterward effected with greater rapidity, but less perfectly, by means of the long wheel and spindle. For the same purpose Arkwright employed two pairs of small rollers, the one pair being placed at a little distance in front of the other. The lower roller in each pair is furrowed or fluted lengthwise, and the upper one is covered with leather; so that, as they revolve in contact with each other, they take first hold of the cotton which passes between them. Both pairs of rollers are turned by machinery, which is so contrived that the second pair shall turn round with much more swiftness than the first. Now suppose that a roving is put between the first pair of rollers. The immediate effect is merely to press it together into a more compact form. But the roving has but just passed through the first pair of rollers, when it is received between the second pair; and as the rollers of the second pair revolve with greater velocity than those of the first, they draw the roving forward with greater rapidity than it is given out by the first pair. Consequently, the roving will be lengthened in passing from one pair to the other; and the fibers of which it is composed will be drawn out and laid lengthwise side by side. The increase of length will be exactly in proportion to the increased velocity of the second pair of rollers.

Two or more rovings are generally united in this operation. Thus, suppose that two rovings are introduced together between the first pair of rollers, and that the second pair of rollers move with twice the velocity of the first. The new roving thus formed by the union of the two will then be of exactly twice the length of either of the original ones. It will, therefore, contain exactly the same quantity of cotton per yard. But its parts will be very differently

arranged, and its fibers will be drawn out longitudinally, and will be thus much better fitted for forming a thread. This operation of doubling and drawing is repeated as often as is found necessary, and the requisite degree of twist is given by a machine similar to the spindle and fly of the common flax-wheel.

The spinning-mule, invented by Samuel Crompton, carried the mechanism of the cotton-factory many steps in advance. Long after Crompton came the self-acting mule. It is a carriage some twenty or thirty feet long, traveling to and fro, and drawing out the most delicate threads through hundreds of spindles, whirling at a rate which scarcely permits the eye to trace their motion. "So great are the improvements effected in spinning machinery, that one man can attend to a mule containing 1088 spindles, each spinning three hanks, or 3264 hanks in the aggregate, per day. In Hindoostan, where they spin by hand, it would be extravagant to expect a spinner to accomplish one hank per day; so that in the United States we find the same amount of manual labor, by improved machinery, doing more than 3000 times the work."

Of the rapidity with which some portions of the machinery employed in the manufacture of cotton operate, we may form an idea from the fact that the very finest thread which is used in making lace is passed through the strong flame of a lamp, which burns off the fibers without burning the thread itself. The velocity with which the thread moves is so great that we can not perceive any motion at all. The line of thread, passing off a wheel through the flame, looks as if it were perfectly at rest; and it appears a miracle that it is not burned.

The successive inventions of Hargreaves, Arkwright, Crompton, and others, would, however, have availed but little unless a sufficiency of the raw material could have

been cheaply obtained. The very first process in the manufacture of cotton—that of cleaning the fiber from the seeds—remained for a period of more than twenty years after the inventions of Arkwright, rude, expensive, and unimproved. The fiber of cotton adheres with considerable tenacity to the seeds; and previous to the year 1793 the separation of the two was effected entirely by hand—the labor of one person for a whole day being only sufficient for cleaning a few pounds of fiber. In 1793, however, Eli



INTERIOR OF A COTTON-MILL.

Whitney, an American, invented the cotton-gin, which at once gave a new character and impulse to the growth as well as the manufacture of cotton. There are two machines for effecting this object—one called the *roller-gin*, applicable mainly to the better qualities of cotton in which the fiber does not adhere to the seed with any great tenacity, and the other the *saw-gin*, which is used for all the cheaper kinds of cotton. By the first, the cotton is simply drawn between two rollers, revolving so nearly in contact

that the size of the seed prevents it from following the fiber. The saw-gin is a receiver, having one side covered with strong parallel wires, about one eighth of an inch apart, between which pass a number of circular saws, revolving on a common axis. The cotton is entangled in the teeth of the saws, and is drawn through the grating, while the seeds are prevented by their size from passing. The cotton thus separated is swept from the saws by a revolving brush, and the seeds fall out at the bottom of the receiver.

This invention of Whitney was the final step by which the whole process of manufacturing cotton into cloth was effected by machinery (the power-loom having been invented some years before). At about the same time, steam was introduced to the world as an agent of limitless power, in driving machinery of every kind; new channels of internal communication were opened between the different parts of the world; chemistry furnished the means for rapidly bleaching the fabrics produced from cotton; and all the resources of science and skill, of invention and industry, seemed combined to create an immensely increased demand for the raw material, upon which all these labors were to be expended. Cotton then began to be more extensively cultivated in the United States. The plant was indigenous upon this continent. According to the testimony of Columbus, the dresses of our Indians were made of cotton. It was found also by the Spaniards in Mexico, and cotton mantles and other articles were sent by Cortes to Charles V. of Spain. The Mexicans were almost wholly dependent upon it for all their fabrics of common use, but the art of manufacturing it had wholly perished from the later races. The cultivation of the cotton-plant in this country began about the year 1660, but so little progress, however, had been made in its culture, that previous to 1780, not a single pound had been exported.

In 1784, the first parcel of American cotton, 3000 pounds, was exported to England. In 1791, 19,200 pounds were exported. The next year the quantity rose to 138,328 pounds. In 1793, Whitney's cotton-gin came into operation, and its immediate effect may be inferred from the fact, that the very next year, in 1794, the United States exported 1,601,760 pounds, and in 1795, 5,276,306. Previous to the invention of the cotton-gin by Whitney, the importation of cotton into Great Britain did not greatly exceed five millions of pounds per annum, and the value of cotton goods exported was only two hundred thousand pounds sterling. Since then, the amount has steadily increased, and in 1852 Great Britain consumed not far from 800,000,000 pounds of raw American cotton, and exported £31,000,000 of manufactured cotton goods.

In 1749, some good people in or near Boston organized a society for the "promotion of industry and economy," the wars preceding that period having introduced a habit of idleness among the people, which the strong religious sentiment of the early settlers determined to discourage and rebuke. On the occasion of their anniversary in 1753, three hundred females of Boston assembled on the Common, with their spinning-wheels and gave a demonstration of their skill in the art of using them. They were neatly attired in cloth of their own manufacture, and a great crowd of spectators collected to witness the scene. This was the first public exhibition of American manufactures, and probably produced as much good and more excitement than those of later days.

In 1787, the first cotton-mill in Massachusetts was erected at Beverly, by John Cabot and others; but such were their difficulties, that in three years they were almost compelled to abandon the enterprise. As a last resort, they petitioned the legislature for assistance, and the committee to whom

the subject was referred reported in favor of granting them one thousand pounds sterling, to be raised by a *lottery*!

In 1786, two Scotch brothers, named Robert and Alexander Barr, erected carding and spinning machines for Mr. Orr, at East Bridgewater, Mass., which was considered of such importance that the legislature, to reward their ingenuity and encourage machinists, "made them a grant of £200, and afterward added to their bounty by giving them six tickets in the State Land Lottery, in which there were no blanks!"

In 1805, the total consumption of cotton in all the United States was a little more than *one thousand bales*! *Now*, the cotton consumed by the mills of Lowell exceeds two million eight hundred and twenty thousand pounds per month.

In 1810, Tench Coxe, of Philadelphia, in accordance with instructions from Albert Gallatin, collected all the information he could, touching the condition of American manufactures at that period. The result of his labors was published in 1812; and according to his report, during the year 1810, Massachusetts manufactured *thirty-six thousand* yards of cotton cloth, and two hundred pieces of duck, the first valued at \$28,000, and the second at \$6,000, which was the extent of her factory operations. In all the States combined, there were only one hundred and forty-six thousand, nine hundred and seventy-four yards of cotton cloth manufactured during that year. *Now*, a single establishment at Lowell produces something more than *five hundred and thirty-six thousand* yards per week, or twenty-five millions, seven hundred and twenty-eight thousand per year. In his ardor to promote domestic manufactures, Mr. Coxe urged families to make their own cloth, and recommended the circulation of official tracts or pamphlets, describing the best machinery for family use; and, by way of inciting the South to increased action, advised them to manufacture, for the

use of their slaves, "a cap of thick home-made, undyed cotton swan-skin, similar in form to the Highland woolen cap of North Britain." He thought such a cap would preserve the health of the slaves, and therefore financially benefit their masters.

The war of 1812 gave a fresh impetus to American manufactures, insomuch that in 1816 a report to Congress showed that forty millions of dollars were then invested in cotton manufactures, and twelve millions in woolen; and that during the year, ninety thousand bales of cotton had been consumed by our factories, and that the aggregate value of all the goods manufactured was equal to about sixty millions of dollars. In 1850, according to the late census report, there were in all the States one thousand and ninety-four establishments for the manufacture of cotton, employing a capital of \$74,501,031, and producing goods annually to the value of \$61,859,184. In 1855, the estimated amount of cotton grown in the United States, was not less than three million, two hundred thousand bales, or allowing four hundred pounds to the bale, *one billion two hundred and eighty millions of pounds.*

The inventions of Arkwright, Whitney, and others, changed the commerce and industry of the world. The machinery by which a man, or woman, or even child, could produce two hundred threads where one was produced before, caused a cheapness of production much greater than that of India, where human labor is scarcely worth any thing. But the fabric of cotton was also infinitely improved by the machinery. The hand of the spinner was unequal to its operations. It sometimes produced a fine thread, and sometimes a coarse one; and therefore the quality of the cloth could not be relied upon. The yarn which is spun by machinery is sorted with the greatest exactness, and numbered according to its quality. This circumstance alone,

which could only result from machinery, has a direct tendency to diminish the cost of production. Machinery not only adds to human power, and economizes human time, but it works up the most common materials into articles of value, and equalizes the use of valuable materials. Thus, in linen of which the thread is spun by the hand, a thick thread and a thin thread will be found side by side; and, therefore, not only is material wasted, but the fabric is less durable, because it wears unequally.

These circumstances—the diminished cost of cotton goods, and the added value to the quality—have rendered it impossible for the cheap labor of India to come into the market against the machinery of Europe and America. The trade in Indian cotton goods is gone forever. Not even the caprices of fashion can have an excuse for purchasing the dearer commodity. We make it cheaper, and we make it better. The trade in cotton, as it exists in the present day, is the great triumph of human ingenuity. England every year imports a considerable amount of cotton from her Asiatic possessions on the other side of the globe—manufactures it into cloth (which formerly she bought from the inhabitants of India), transports it back to the Calcutta markets, and there, encumbered as it is with the cost of transport for fourteen thousand miles, is enabled to sell with a profit to the Hindoos, cheaper than they can produce it themselves. They, therefore, buy it with eagerness.

Nearly twenty years after Arkwright had begun to spin by machinery, that is in 1786, the price of a particular sort of cotton-yarn, much used in England, was thirty-eight shillings a pound. The same yarn in 1832, was two shillings a pound. In 1807, American merchants in Boston and Salem, were engaged in importing cotton cloth from India; now the same merchants export American cottons in large quantity for Asiatic consumption. In 1807, a particular kind of

cotton cloth sold in Boston for twenty-nine cents per yard; in 1823 the same cloth sold for seventeen cents, but at the present time a better article may be bought for seven or eight cents. The printing of cotton calicoes first commenced in the United States in 1829. It has since made such an astonishing progress, that the quantity now printed exceeds 70,000,000 of yards annually. The price of calico is also three fourths less than it was forty years ago, the quality and beauty of the fabric having at the same time increased.

We do not possess in the United States any very certain data showing the production of our looms. It has been calculated that in England, the home consumption of cotton cloth is equal to twenty-six yards for every individual of the population annually. Allowing the same ratio to exist between the population of the United States, and the consumption of cloth (the population being assumed at 20,000,000), the annual quantity required would be 520,000,000 of yards. At ten cents a yard the 520,000,000 yards of cloth would cost \$52,000,000. At twenty cents a yard, which was less than the average price forty years ago, the cost would amount to \$104,000,000. And at twelve or fourteen times the present price, or a dollar and twenty cents per yard, which proportion we get by knowing the price of cotton-yarn seventy years ago and at the present day, the cost of 520,000,000 yards of cotton cloth, would be \$624,000,000. It is perfectly clear that no such sum of money could be paid by the people of the United States for cotton goods, and that in fact, instead of between fifty and sixty millions being spent in this article of clothing by persons of all classes, in consequence of the cheapness of the commodity, we should go back to very nearly the same consumption that existed in England before Arkwright's invention, that is, to the consumption of the year 1750, when the whole amount of the cotton manufacture of Great

Britain did not exceed the annual value of £200,000. At that rate of value, the quantity of cloth manufactured could not have been equal to one five-hundreth part of that which is now manufactured in England for home consumption. Where one person a century ago consumed one yard, the consumption per head has risen to about twenty-six yards. This vast difference in the comforts of every family, by the ability which they now possess of easily acquiring warm and healthful clothing, is a clear gain to all society, and to every one as a portion of society. It is more especially a gain to the females and the children of families, whose condition is always degraded when clothing is scanty. The power of procuring cheap clothing for themselves, and for their children, has a tendency to raise the condition of females more than any other addition to their stock of comfort. It cultivates habits of cleanliness and decency; and those are little acquainted with the human character who can doubt whether cleanliness and decency are not only great aids to virtue, but virtues themselves. There is little self-respect amid dirt and rags, and without self-respect there can be no foundation for those qualities which most contribute to the good of society. The power of procuring useful clothing at a cheap price has raised the condition of women among us, and the influence of the condition of women upon the welfare of a community can never be too highly estimated.

That the manufacture of cotton by machinery has produced one of the great results for which machinery is to be desired, namely, cheapness of production, can not, we think, be doubted. If increased employment of human labor has gone along with that cheapness of production, even the most prejudiced can have no doubt of the advantages of this machinery to all classes of the community.

At the time that Arkwright commenced his machinery,

a man named Hargreave, who had set up a less perfect invention, was driven out of Lancashire, in England, at the peril of his life, by a combination of the old spinners by the wheel.* In 1789, when the spinning machinery was intro-

* It is difficult at the present day to realize the amount of opposition which attended the first attempts to introduce the manufacture of cotton into Great Britain. In order to protect woolen manufactures, laws were enacted forbidding the use of cotton garments, under the penalty of fine and imprisonment. The laboring classes, who considered cotton detrimental to their interests, frequently manifested their hostility to it by riot and bloodshed; vagabonds, too lazy to work, pretended that cotton had thrown them out of employment and reduced them to pauperism; and felons occasionally pleaded cotton as an extenuation of their crimes; an amusing instance of which may be found in the following letter, published in the "Gentlemen's Intelligencer," for May, 1784:

"[From Cork, in Ireland.]

"This day, one Michael Carmody was executed here for felony, upon which the journeymen weavers of the city (who labor under great difficulties by reason of the deadness of trade, occasioned by the pernicious practice of wearing cottons) assembled in a body, and dressed the criminal, hangman, and the gallows in cottons, in order to discourage the wearing thereof. And at the place of execution the criminal made the following remarkable speech:

"Give ear, O good people, to the words of a dying sinner: I confess I have been guilty of many crimes that necessity compelled me to commit, which starving condition I was in, I am well assured, was occasioned by the scarcity of money that has proceeded from the great discouragement of our woolen manufactures. Therefore, good Christians, consider that if you go on to suppress your own goods, by wearing such cottons as I am now clothed in, you will bring your country into misery, which will consequently swarm with such unhappy malefactors as your present object is; and the blood of every miserable felon that will hang, after this warning from the gallows, will lie at your doors. And, if you have any regard for the prayers of an expiring mortal, I beg that you will not buy of the hangman the cotton garments that now adorn the gallows, because I can't rest quiet in my grave if I should see the very things wore that brought me to misery, thievery, and this untimely end; all which I pray of the gentry to hinder their children and servants, for their own charac-

duced into Normandy, in France, the hand-spinners there also destroyed the mills, and put down the manufacture for a time. Lancashire and Normandy are now, in England and France, the great seats of the cotton manufacture. The people of Lancashire and Normandy had not formerly the means, as we have now, of knowing that cheap production produces increased employment. There were many examples of this principle formerly to be found in arts and manufactures; but the people were badly educated upon such subjects, principally because studious and inquiring men had thought such matters beneath their attention. We live in times more favorable for these researches. The people of Lancashire and Normandy, at the period we mention, being ignorant of what would conduce to their real welfare, put down the machines. In both countries there were a very small portion of the community that attempted such an illegal act. The weavers were interested in getting cotton yarn cheap, so the combination was opposed to their interests; and the spinners were chiefly old women and girls, very few in number, and of little influence. Yet they and their friends, both in England and France, made a violent clamor, and but for the protection of the laws, the manufactories in each country would never have been set up. What was the effect upon the condition of this very population? M. Say, in his "Complete Course of Political Economy," states, upon the authority of an English manu-

ter's sake, though they have no tenderness for their country, because none will hereafter wear cotton but oysterwomen, criminals, hucksters, and common hangmen.' "

What would poor Micky say now, could he rise from his dishonored grave and learn that, despite his prophecy, almost every man, woman, and child in the civilized world wore that same hated cotton that brought him to the hemp, and that it dispensed happiness and comfort to millions of the human race, who earned their subsistence by its culture and manufacture?

facturer of fifty years' experience, that, in ten years after the introduction of the machines, the people employed in the trade, spinners and weavers, were more than forty times as many as when the spinning was done by hand. The spinning machinery of Lancashire alone now produces as much yarn as would require more than the entire population of Great Britain to produce with the distaff and spindle. This immense power might be supposed to have superseded human labor altogether in the production of cotton yarn. It did no such thing. It gave a new direction to the labor that was formerly employed at the distaff and spindle; but it increased the quantity of labor altogether employed in the manufacture of cotton, at least a hundredfold. It increased it too where an increase of labor was most desirable. It gave constant, easy, and not unpleasant occupation to women and children. In all the departments of cotton spinning, and in many of those of weaving by the power-loom, women and children are employed. There are degrees, of course, in the agreeable nature of the employment, particularly as to its being more or less cleanly. But there are extensive apartments in large cotton-factories, where great numbers of females are daily engaged in processes which would not soil the nicest fingers, dressed with the greatest neatness, and clothed in materials (as all women are now clothed) that were set apart for the highest in the land a century ago. And yet there are some who regret that the aged crones no longer sit in the chimney-corner, earning a few cents daily by their rude industry at the wheel!

The creation of employment among ourselves by the cheapness of cotton goods produced by machinery, is not to be considered as a mere change from the labor of India to the labor of England or the United States. It is a creation of employment, operating just in the same manner as the machinery did for printing books. The Indian, it is true,

no longer sends us his calicoes and his colored stuffs; we make them ourselves. But he sells us fifty times the amount of raw cotton that he used to when the machinery was first set up. The workman on the banks of the Ganges is no longer weaving calicoes in his loom of reeds under the shadow of a palm-tree; but he is gathering fifty times as much cotton as he gathered before, and making fifty times as much indigo to color it with.

The change that has been produced upon the labor of India by the machinery employed for spinning and weaving cotton, has a parallel in the altered condition of the hand-loom weavers in Great Britain. In 1785 Dr. Cartwright produced his first *power loom*. It was a rude machine compared with the refinements that have successively been made on his principle. Every resistance was made to the introduction of this new power. The mill owners were slow to perceive its advantages; the first mills in which these looms were introduced were burned. The hand-loom weavers worked at a machine which little varied from that with which their Flemish instructors had worked three centuries before. But no prejudice and no violence could prevent the progress of the new machine. The object for which machines are established, and the object which they do effect, is cheapness of production. Machines either save material or diminish labor, or both. "Which is the cheapest," said the committee of the House of Commons to Joseph Foster, "a piece of goods made by a power-loom, or a piece of goods made by a hand-loom?" He answered, "a piece made by the power-loom is the cheapest." This answer was decisive. The hand-loom weavers of England have continued to struggle, even up to this time, with the greater productive power of the power-loom; but the struggle is nearly over. It would have been terminated long ago, if the miserable wages which the hand-loom weaver obtained, had not

been eked out by charitable contributions. It was the duty of society to break the fall of the workman who were thrust out of their place by the invention; but had society attempted to interpose between the new machines and the old, so as to have kept the old workers to their less profitable employment, there would have been far more derangements of labor to mitigate. Upon the introduction of the spinning machinery into England, there was great temporary distress of the hand-spinners, with rioting and destruction of spinning-mills. If these modes of resistance to invention had gone on to prevent altogether the manufacture of cotton thread by the spinning machinery in England, the consumption of cotton cloth would have been little increased, and the number of persons engaged in the manufacture would have been twenty, thirty, or even forty times less than the present number. But there would have been another result. Would the great body of the people of other countries have chosen to wear for many years *dear* cloth instead of *cheap* cloth, that a few thousand spinners might have been kept at their ancient wheels in England? Capital can easily shift its place, and invention follows where capital goes before. The people of France, and Germany, and America, would have employed the cheap machine instead of the dear one; and the people of England would have had cheap cloth instead of dear cloth from thence. We can not build walls of brass round any country; and the thin walls of prohibitive duties are very easily broken through. A profit of from twenty to thirty per cent. will pour in any given quantity of smuggled goods that a nation living under prohibitive laws can demand. Bonaparte, in the height of his power, passed the celebrated Berlin decree for the exclusion of all English produce from the continent of Europe. But English merchants laughed at him. The whole coast of France, and Holland, and Italy, became one

immense receiving place for smuggled goods. If he had lined the whole coast with all the six hundred thousand soldiers that he marched to Russia, instead of a few custom-house officers, he could not have stopped the introduction of English produce. It was against the nature of things that the people who had been accustomed to cheap goods should buy dear ones; or that they should go without any article, whether of necessity or luxury, whose use had become general. Mark, therefore, if the cotton-spinners of England had triumphed eighty years ago over Arkwright's machinery, there would not have been a single man, woman, or child of those spinners employed *at all*, within twenty years after that most fatal triumph. The manufacture of cotton would have gone to other countries; cotton-spinning in England would have been at an end. The same thing would have happened if the power-loom, fifty years ago, had been put down by combination; other countries would have used the invention which England would have been foolish enough to reject. Forty years ago the manufacturers of the United States had adopted the power-loom.

In the cotton manufacture, which from its immense amount possesses the means of rewarding the smallest improvement, invention has been at work, and most successfully, to make machines that make machines that make the cotton thread. There is a part of the machinery used in cotton-spinning called a reed. It consists of a number of pieces of wire, set side by side in a frame, resembling, as far as such things admit of comparison, a comb with two backs. These reeds are of various lengths and degrees of fineness; but they all consist of cross pieces of wire, fastened at regular intervals between longitudinal pieces of split cane, into which they are tied with waxed thread. A machine now does the work of reed-making. The materials enter the machine in the shape of two or three yards of

cane, and many yards of wire and thread ; and the machine cuts the wire, places each small piece with unfailing regularity between the canes, twists the thread round the cane with a knot that can not slip, every time a piece of wire is put in, and does several yards of this extraordinary work in less time than we have taken to write the description. There is another machine for making a part of the machine for cotton-spinning, even more wonderful. The cotton wool is combed by circular cards of every degree of fineness ; and the card-making machine, receiving only a supply of leather and wire, does its own work without the aid of hands. It punches the leather—cuts the wire—passes it through the leather—clinches it behind—and gives it the proper form of the tooth in front—producing a complete card of several feet in circumference in a wonderfully short time. All men feel the benefit of such inventions, because they lessen the cost of production. The necessity for them always precedes their use. There were not reed-makers and card-makers enough to supply the demands of the cotton machinery ; so invention went to work to see how machines could make machines ; and the consequent diminished cost of machinery has diminished the price of clothing.

CHAPTER XIX.

THE WOOLEN MANUFACTURE.—DIVISIONS OF EMPLOYMENT.—EARLY HISTORY.—
PROHIBITORY LAWS.—THE JACQUARD LOOM.—MIDDLE-AGE LEGISLATION.—SUMP-
TUARY LAWS.—THE SILK MANUFACTURE.—RIBBON-WEAVING.—THE LINEN MANU-
FACTURE.—OLD WOOLEN RAGS.—CLOTH-PRINTING.—BLEACHING.

THOSE who have not taken the trouble to witness, or to inquire into, the processes by which they are surrounded with the conveniences and comforts of civilized life, can have no idea of the vast variety of ways in which invention is at work to lessen the cost of production. The people of India, who spin their cotton wholly by hand, and weave their cloth in a rude loom, would doubtless be astonished when they first saw the effects of machinery, in the calico which is returned to their own shores, made from the material brought from their own shores, cheaper than they themselves could make it. But their indolent habits would not permit them to inquire how machinery produced this wonder. There are many among us who only know that the wool grows upon the sheep's back, and that it is converted into a coat by labor and machinery. They do not estimate the prodigious power of thought—the patient labor—the unceasing watchfulness, the frequent disappointment, the uncertain profit—which many have had to encounter in bringing this machinery to perfection, and in organizing the modes of its working, in connection with labor. Further, their knowledge of history may have been confined to learning by rote the dates when kings

began to reign, with the names of the battles they fought or the rebels they executed. Of the progress of commerce and the arts they may have been taught little. The records of wool constitute a real part of the history of England; and form, in our opinion, a subject of far more permanent importance than the scandalous annals of the wives of Henry VIII., or the mistresses of Charles II.

Let us first take a broad view of the more prominent facts that belong to the woollen manufacture; and then proceed to notice those of other textile fabrics.

The reader will remember that when the fur-traders refused to advance to John Tanner a supply of blankets for his winter consumption, he applied himself to make garments out of moose-skins. The skin was ready manufactured to his hands when he had killed and stripped the moose; but still a blanket brought across the Atlantic was to him a cheaper and a better article of clothing than the moose-skin which he had at hand; and he felt it a privation when the trader refused it to him upon the accustomed credit. It never occurred to him to think of manufacturing a blanket; although he was in some respects a manufacturer. He was a manufacturer of sugar, among the various trades which he followed. He used to travel about the country till he had found a grove of maple-trees; and here he would sit down for a month or two till he had extracted sugar from the maples. Why did he not attempt to make blankets? He had not that Accumulated Knowledge, and he did not work with that *Division of Labor*, which are essential to the manufacture of blankets—both of which principles are carried to their highest perfection when united enables the manufacture of woollen cloth, or any other article, to be carried forward upon a large scale. It will be necessary to trace what accumulations of skill, and what degrees of employment, were necessary to

enable Tanner to clothe himself with a piece of woollen cloth. We shall not stop to inquire whether the skill has produced the division of employment, or the division of employment has produced the skill. It is sufficient for us to show, that the two principles are in joint operation, unitedly carrying forward the business of production in the most profitable manner. It is enough for us to know, that where there is no skill there is no division of employment, and where there is no division of employment there is no skill. Skill and division of employment are inseparably wedded. If they could be separated, they would in their separation cease to work profitably. They are kept together by the constant energy of capital, devising the most profitable direction for labor.

Before a blanket can be made, we must have the material for making a blanket. Tanner had not the material, because he was not a cultivator. Before wood can be grown there must be, as we have shown, appropriation of land. When this appropriation takes place, the owner of the land either cultivates it himself, which is the earliest stage in the division of agricultural employment—or he obtains a portion of the produce in the shape of corn or cattle, or in a money payment. But the farmer, to manufacture wool at the greatest advantage, must possess capital, and carry forward the principle of the division of employment by hiring laborers. We use the word *manufacture* of wool advisedly; for all farming processes are manufacturing processes, and invariably reduce themselves to change of form, as all commercial processes reduce themselves to change of place. If the capital of the farmer is sufficient to enable him to farm upon a large scale, he divides his laborers; and one becomes a shepherd, one a plowman—one sows the ground, and one washes and shears the sheep, more skillfully than another. If he has a considerable farm, he divides his land,

also, upon the same principle, and has pasture, and arable land, and rotation of crops. By these divisions he is enabled to manufacture wool cheaper than the farmer upon a small scale, who employs one man to do every thing, and has not a proper proportion of pasture and arable land, or a due rotation of crops. At every division of employment skill must be called forth in a higher perfection than when two or more employments were joined together; and the chief director of the skill, the capitalist himself, or farmer, must require more skill to make all the parts which compose his manufactory work together harmoniously.

But we have new divisions of employment to trace before the wool can be got to the manufacturer. These employments are created by what may be called the *local* division of labor. It is convenient to rear the sheep upon the mountains of Vermont, because there the pastures are fitted for the growth of wool. It is convenient to manufacture the wool into cloth at Lowell, because water-power is there at hand to give motion to the machinery, with which the manufacture is carried on. The farmer in Vermont, and the manufacturer of cloth at Lowell, must be brought into connection. In the infancy of commerce one or both of them would make a journey to establish this connection; but the cost of that journey would add to the cost of the wool, and therefore lessen the consumption of woollen cloth. The division of employment goes on to the creation of a wool-agent, or dealer in wool, who either purchases directly from the grower, or sells to the manufacturer for a commission from the grower. The grower, therefore, sends the wool direct to the agent, whose business it is to find out what manufacturer is in want of wool. If the agent did not exist, the manufacturer would have to find out, by a great deal of personal exertion, what farmer had wool to sell; or the farmer would have to find out, with the same

exertion, what manufacturer wanted to buy wool. The agent receives a commission, which the seller and buyer ultimately unite in paying. They co-operate to establish a wool-dealer, just as we all co-operate to establish an express; and just as the agent, who delivers a number of packages to a great many individuals, does that service at little more cost to all, than each individual would pay for the delivery of a single package, so does the wool-dealer exchange the wool between the grower and the manufacturer, at little more cost to a large number of the growers who employ him, than each would be obliged to pay in expenses and loss of time to travel from Vermont to Lowell to sell his wool.

We have, however, a great many more divisions of employment to follow out before the wool is conveyed from the farm where it is grown to the place where it is manufactured. If the packs are taken on shipboard, we have all the variety of occupations, involving different degrees of skill, which make up the life of a mariner; if they go forward upon the rail-road we have all the higher degrees of skill involved in their transport which belong to the business of an engineer; or if they finally reach their destination by canal, we have another division of labor that adjusts itself to the management of boats in canals. But the ship, the rail-road, the canal, which are created by the necessity of transporting commodities from place to place, have been formed after the most laborious exercise of the highest science, working with the greatest mechanical skill; and they exist only through the energy of prodigious accumulations of capital, the growth of centuries of patient and painful labor and economy.

We have at length the wool in a manufactory. The first class of persons who prepare the wool, are the sorters and pickers. It is their business to separate the fine from

the coarse locks, so that each may be suited to different fabrics. There is judgment required, which could not exist



MICROSCOPIC APPEARANCE OF WOOL.*

without division of labor; and the business, too, must be done rapidly, or the cost of sorting and picking would outweigh the advantage. The second principal operation is scouring. Here the men are constantly employed in washing the wool, to free it from all impurities. It is evident

that the same man could not profitably pass from

the business of sorting to that of scouring, and back again—from dry work to wet, and from wet to dry. When the wool is out of the hands of the scourers it comes into those of the dyers, who color it with the various chemical agents applied to the manufacture. The carders next receive it, who tear it with machines till it attains the requisite fineness. From the carders it passes to the slubbers, who form it into tough loose threads; and thence to spinners, who make the threads finer and stronger. There are subdivisions of employment which are not essential for us to notice, to give an idea of the great division of employment, and

* The fibers of wool, when examined under the microscope, are seen to possess a *scaly surface*, causing the edge of the fiber to have the appearance of a *fine saw*, with the teeth sloping in the direction from the roots to the points. Were a number of thimbles with uneven edges inserted into each other, a cylinder would result not dissimilar in outline from a filament of merino wool. It is to this peculiar structure that wool owes its property of felting.

the consequent accumulation of peculiar skill, required to prepare wool to be made into yarn, to be made into woollen cloth.

The next stages in the manufacture are the spinning, the warping, the sizing, and the weaving. These are all distinct operations, and are all carried forward with the most elaborate machinery, adapted to the division of labor which it enforces, and by which it is enforced.

But there is a great deal still to be done before the cloth is fit to be worn. The cloth, now woven, has to be scoured as the wool was. There is a subsequent process called burling, at which females are constantly employed. The boiling and milling come next, in which the cloth is again exposed to the action of water, and beaten so as to give it toughness and consistency. Dressers, called giggers, next take it in hand, who also work with machinery upon the wet cloth. It has then to be dried in houses where the temperature is sometimes as high as 130 degrees, and where the men work almost naked. It is evident that the boilers and dressers could not profitably work in the dry-houses; and that there must be division of employment to prevent those sudden transitions which would destroy the human frame much more quickly than a regular exposure to cold or heat, to damp or dryness. The cloth must be next cropped or cut upon the face, to remove the shreds of wool which deform the surface in every direction. When cut, it has to be brushed dry by machinery, to get out the croppings which remain in its texture. This done, it is dyed in the shape of cloth, as it was formerly dyed in the shape of wool. Then come a variety of processes, to increase the delicacy of the fabric: singeing, by passing the cloth within a burning distance of red-hot cylinders; friezing, to raise a nap upon the cloth; glossing, by carrying over it heavy heated plates of iron; pressing, in which operation of the press red-

hot plates are also employed; and drawing, in which men, with fine needles, draw up minute holes in the cloth when it has passed through the last operation. Then comes the packing; and after all these processes it must be bought by a wholesale dealer, and again by a retailer, before it reaches the consumer. Between the growth of the fleece of wool, and the completion of a coat by a skillful tailor—who, it is affirmed, puts five-and-twenty thousand stitches into it—What an infinite division of employments! what inventions of science! what exercises of ingenuity! what unwearied application! what painful, and too often unhealthful labor! And yet if men are to be clothed well and cheaply, all these manifold processes are not in vain; and the individual injury in some branches of the employ is not to be compared to the suffering that would ensue if cloth were not made at all, or if it were made at such a cost that the most wealthy only could afford to wear it. But for the accumulation of knowledge, and the division of employments, engaged in the manufacture of cloth, and set in operation by large capital, we should each be obliged to be contented with a blanket such as John Tanner desired, and very few indeed would even obtain that blanket; for if skill and division of labor were not to go on in one branch, they would not go on in another, and then we should have nothing to give in exchange for the blanket. The individual injury to health, also, produced by the division of labor, is not so great, upon the average, as if there were no division. All the returns of human life in this country show an extremely little difference in the effect upon life, even of what we consider the most unhealthy trades; and this proceeds from that extraordinary power of the human body to adapt itself to a habit, however apparently injurious, which is one of the most beautiful evidences of the compensating principle which prevails throughout the moral world.

The wool manufacture of Great Britain employs very nearly 300,000 persons; in the various processes connected with the production of cloth, worsted, flannel, blankets, and carpets. What a contrast to all this variety of labor is the history of the earlier stages of the manufacture of woollen cloth. It is unnecessary to go back to the time of Henry III., when the production of wool was in such an imperfect state through flocks of sheep being scattered over immense tracts of waste land, that a manor was held under the crown by the tenure of gathering wool for the Queen. According to the record, Peter de Baldewyn was to gather the wool from the thorns that had torn it from the sheep's back; and if he did not choose to gather it he was to forfeit twenty shillings.* In the time of Edward III., according to Fuller, in his "Church History," the English clothiers were wholly unskillful; "knowing no more what to do with their wool than the sheep which wear it, as to any artificial and curious drapery, their best cloth being no better than frieze, such their coarseness for want of skill in the making." When the Flemish clothiers came into England, the manufacture improved; in spite of the regulating power of the state, which was perpetually interfering with material, quality, and wages. In time wool became the chief commodity of England. The woolsack of the House of Lords, as the seat of the Lord Chancellor is designated, was typical of this staple industry; and of the mode also in which the majesty of legislation sat heavy upon the produce. To encourage the manufacture nothing was to be woven but wool. From the cradle to the grave all were to be wrapt in wool.† In order to promote the knitting of caps from

* Blount's "Ancient Tenures," ed. 1784, p. 183.

† It was enacted at one time by the English Parliament, that no person should be buried in any shroud, or winding-sheet, which was composed of material other than wool.

woolen yarn, the English parliament in 1571, enacted "that every person above the age of seven years should wear a woolen cap of English make, on Sundays and holidays, on pain of forfeiting 3s. 4d. a day if they neglected to wear such a cap, lords, knights, and landed gentry excepted." The genius of prohibition prevented the exchange of wool with other manufactured commodities; and therefore, to keep up rents, Narcissa was "odious in woolen," and a Holland shirt—for British linen did not exist—was a rare commodity, cheap at "eight shillings an ell," as in the days of Dame Quickly.

This was the state of things in Great Britain at the end of the seventeenth century, and somewhat later. The manufacturers clamored against the exportation of wool; and the agriculturalists at the same time resisted the importation of Irish and Scotch cattle. The parliament listened to both sets of clamorers. It said to the people, You of trade shall not be ruined by the land selling wool to foreigners—there shall be no competition; you shall buy the wool at the lowest price. And then parliament turned to the complaining grazier, and said, The cloth-maker and his men shall not ruin you by buying meat cheap—no Irish cattle or Scotch sheep shall come here to lower your prices. In 1566 it was enacted that whoever imported into England any live sheep, should suffer for the first offense the forfeiture of his entire substance, imprisonment for a year, and the loss of his left hand, while the second offense was death without benefit of clergy. This act was passed under the impression that the English sheep was the only kind in the world suited to the manufacture of broadcloth. From 1664 to 1824 the exportation of wool from England was strictly prohibited. The importation was sometimes prevented by high duties—sometimes encouraged by low. The manufacture was constantly struggling with these attempts of the state to hold

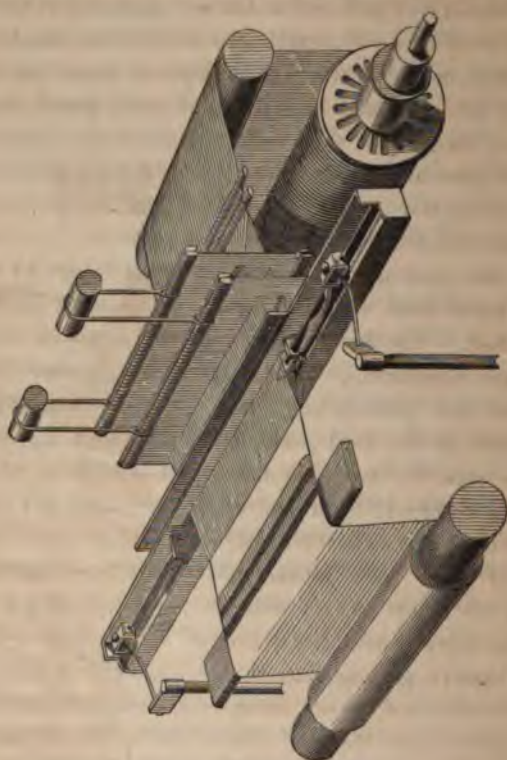
a balance between what were so universally considered as conflicting interests. In 1844 the whole system was abandoned. In 1853, Great Britain imported 117,000,000 pounds of sheep and lamb's wool—of which three fifths came from Australia—and 2,000,000 of alpaca and lama wool. The wool-growers at home still found a ready market; the great body of the population had good coats and flannels, and blankets; and, in addition, English manufacturers exported £10,000,000 sterling of woollen manufactures to the United States and other countries.

The employment of wool in the manufacture of broad-cloth and flannel was, a few years ago, almost the entire business of the woollen factories. The novel uses to which wool is now applied, and the almost innumerable varieties of articles of clothing which are produced from long wool and short wool—from combinations of alpaca wool and coarse wool, of wool with cotton, of wool with silk—together with the introduction of brilliant dyes and tasteful designs, formerly unknown—have established vast seats of manufacture in Great Britain which are almost peculiar to that country, and which have converted, in a few years, humble villages into great cities.* The finest Paisley

* The largest single manufacturing establishment in the world has recently been opened at Saltaire, Yorkshire, England, for the manufacture of cloth from the wool, or hair, of the alpaca goat. The vastness of this great work will be seen from the following statement, which yet applies to only one department. The weaving-shed contains 1200 looms. The length of the shafting is nearly ten miles, and weighs between six and seven hundred tons. The steam-engines, to work these shafts, are equal to 1250 horse-power, and the looms in the one apartment are capable of weaving thirty thousand yards, or nearly eighteen miles of alpaca cloth every day, and an aggregate length of 5688 miles of cloth annually. The building covers six acres of ground; and the floors in the several buildings, including warehouses and sheds, cover an extent of eleven acres and a half.

Around this enormous mill is growing up the town of Saltaire

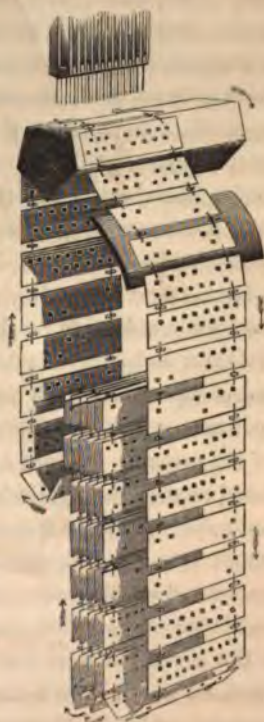
(Scotch) shawls rival the elaborate handicraft of Hindoostan; and, what is of more importance, the humblest female



MECHANISM OF POWER-LOOM.

town begins with seven hundred houses, built on the best principles, and including every convenience necessary for the health and comfort of its inhabitants. It will consist of spacious squares and streets, grounds for recreation, schools, places of worship, baths, and wash-houses. The alpaca wool has been known in England for about forty years, but its manufacture is comparatively recent. The manufacture was commenced by Mr. Salt, in 1836. For the five years succeeding, the average annual imports into Great Britain were 560,000 lbs. In 1851 the consumption was 2,186,480 lbs.

may purchase a tasteful article of dress at a price which a few years ago would have been thought fabulous. The wonderful variety of patterns which we see in these and other productions of modern skill are effected by the Jacquard apparatus, in which the pattern depends upon the disposition of holes pierced in separate bits of pasteboard. In common weaving, the weft threads pass alternately under and over the entire warp threads, which are lifted up to allow the weft in the shuttle to traverse from one side to the other. The Jacquard apparatus determines, by the number and arrangement of the holes in the cards, which of the separate warp threads shall be so lifted; for at every throw of the shuttle the blank part of each card moves a series of levers which raise certain warp threads; while other levers, passing into the holes in the card, do not affect the other warp threads. In this way, patterns of the greatest complexity are woven in cotton, and worsted, and silk; so that even a minute work of art, such as a portrait or a landscape, may be produced from the loom. Every pattern requires a separate set of cards. We do not expect this brief notice to be readily understood. Those who would comprehend the extent of ingenuity involved in the prin-



JACQUARD CARDS.

ple of this invention, and the beautiful results of which it is capable, should witness its operation in a Jacquard loom. In a bobbin-net machine the cards are connected with a revolving pentagonal bar, each side of which is pierced with holes, corresponding with the pins or levers above. When a card comes over the topmost side of the pentagon the levers drop; but those pins only which enter through the holes in the card affect the pattern which is being worked. Any one who views this complicated arrangement in a lace-machine, must give no small amount of attention to comprehend its mysterious movements; and when the connection is perceived between that chain of dropping cards, and the flower that is being worked in the lace, a vague sense of the manifold power of invention comes over the mind—we had almost said an awful sense.

If there be one thing more remarkable than another in the visible condition of the people of the United States and of Great Britain, it is the universality of useful, elegant, and cheap clothing. There is very small distinction in the ordinary coat and pants of the millionaire and the best dress of the artizan; and not a great deal more in the gown and shawl of the aristocratic lady and those of the handmaid of her toilet. Perhaps the absence of mere finery, and the taste which is an accompaniment of superior education, constitute the chief difference in the dress of various ranks. This feature of the present times is a part of our social history.

For several centuries the domestic trade of England was hemmed round and fettered by laws against extravagance in dress, which had always been a favorite subject for the experimentalizing of barbarous legislation. An act of 1463, recites that the Commons pray their lord the king to remember that in the times of his noble progenitors, ordinances and statutes were made for the apparel and array of the commons, as well of men as of women, so that none of

them should use or wear any inordinate or excessive apparel, but only according to their degrees. However, we find that all these ordinances had been utterly fruitless. The parliament makes new ordinances. The nobles, according to these, may wear whatever they please; knights and their wives were to wear no cloth of gold, or fur of sable; no person under the state of a lord to wear any purple silk; no esquires or gentlemen and their wives any silk at all; no persons not having possessions of the yearly value of forty pounds, any fur; and, what is cruel indeed, no widow but such as hath possessions of the value of forty pounds, shall wear any fur, any gold or silver girdle, or any kerchief that had cost more than three shillings and fourpence; persons not having forty shillings a-year were denied the enjoyment of fustian and scarlet cloth; the yeoman was to have no stuffing in his doublet; nor servants in husbandry, broadcloth of a higher price than two shillings a yard. The length of gowns, jackets, and cloaks, was prescribed by the same statute; and the unhappy tailor who exceeded the length by the breadth of his nail, was to be mulcted in the same penalties as those who flaunted in skirts of more than needful longitude. The men and women of the mystery and workmanship of silk prefer their piteous complaint to parliament, that silk-work, ready wrought is brought into the realm. If it had occurred to them to petition that the gentlemen and their wives might be permitted to wear satin, as well as their lords, their piteous complaint of want of occupation might have been more easily redressed than by foreign prohibition. Sumptuary laws have long been abolished; but to them succeeded the laws of custom, which prescribed one sort of dress to one condition of people, and another to another. We can not doubt which state gives most employment to manufactures—the law of exclusiveness, or the law of uni-

versality. If the laborer and artificer were still restricted, by enactment or by custom, to the wearing of cloth of a certain price per yard, we may be quite sure that the manufacture of the finer cloths would be in no flourishing condition: and if the servant-maid could not put on her Sunday gown of silk, we may be equally clear that the silk-trade would continue to be the small thing that it was a century ago, instead of being, as it is now, one of the great staple trades of the country.

When the frame-work knitters of silk stockings petitioned Oliver Cromwell for a charter, they said, "the Englishman buys silk of the stranger for twenty marks, and sells him the same again for one hundred pounds." The higher pride of the Englishman of the present day is, that he buys seven million pounds of raw silk from the stranger, employs a hundred and fourteen thousand of his countrymen in the manufacture of it by the aid of machinery, and sell it to the stranger and his own people, at a price as low as that of the calico of half a century ago.

When a boy who keeps silk-worms upon mulberry leaves, puts a spinning-worm into a little paper bag, and finally obtains an oval ball of silk, he does upon a small scale what is done in the silk-growing countries upon a large scale. When he winds off his cocoon of silk upon a little reel, he is engaged in the first process of silk making. There must be myriads of silk-worms reared to produce the seven million pounds of raw silk that Great Britain manufactures. The school-boy, from three or four silk-worms, can obtain a little skein of silk, which he carefully puts between the leaves of a book, and looks at it again and again, in delight at its glossy beauty. Perhaps he does not take the trouble to think how many such skeins would be required to produce a pair of silk stockings. As the school-boy puts his skein into a book, so the silk-producers of India, Italy, Persia, and



HANKS OF SILK. *a*, BENGAL; *b*, ITALIAN; *c*, PERSIAN; *d*, BROUSSA.



EGYPTIAN SILK REEL.

Turkey, send us their hanks of silk, which we call by various names, made up as shown in the figures. In Egypt, a silk-producing country, a woman has a simple machine for preparing the hanks of silk for the purposes of commerce. She winds the silk upon a reel. She has no moving power but that of her hand and arm. In England a woman also attends to a winding-machine, by which the silk is transferred to bobbins, for the purpose of being spun to various degrees of fineness. She has no labor to perform, beyond the providing a supply of material to be wound, removing a bobbin when it is filled, placing an empty one its place, and occasionally piecing a broken thread. She is doing what the machine can not do—adjusting her operations to many varying circumstances. The machine is moved by the steam-engine; but the steam-engine, the reels, and the bobbins would work unavailingly, without the guidance of the mind that waits upon and watches them.



MICROSCOPIC APPEARANCE OF THE SILK FIBER.

The peculiarity in the manufacture of silk-twist, or thread, as distinguished from that of cotton, or flax, or wool, is that it is produced naturally in one uninterrupted length. The object of the machinery of a silk-mill is, not to combine

short fibers in a continuous thread by spinning, but to wind and twist, so as to unite many slight threads already formed into one thread of sufficient strength for the purpose of weaving or of sewing. The subsequent processes are the same as with the fibrous substances. The machinery by which these processes are carried on has been improved, by successive degrees, since Thomas Lombe erected the first silk-mill in England, in the beginning of the eighteenth century. He obtained a patent which expired in 1732; and parliament, refusing to renew his patent, granted him a compensation, upon the condition that he should deposit an exact model of his machinery in the Tower of London. That model was shown to the visitors of the Tower in the present century; and, by comparison with the vast array of spindles in a modern silk-mill, would seem as inefficient as the flail compared with the thrashing-machine.

Thomas Firmin, an English philanthropic writer, who published "Proposals for the Employment of the Poor," in 1681, says, "It is a thing greatly to be wished that we could make linen cloth here as cheap as they send it us from abroad." He thought the poor might then be employed; but he despairingly adds, "if that can not be done, nor any other way found out to employ our poor people, we had much better lose something by the labor of our poor, than lose all their labor;" and so he proposes to give those who were idle flax and hemp to spin in spacious workhouses. The notion was a benevolent one; and it was the favorite scheme, for half a century, to destroy idleness and beggary in England, by setting up manufactories at the public cost. Defoe saw the fallacy of the principle, and resisted it with his strong common sense: "Suppose now a workhouse for the employment of poor children sets them to spinning of worsted. For every skein of worsted these poor childre

spin, there must be a skein the less spun by some poor person or family that spun it before." Defoe saw that there could be no profitable increase of labor without increase of consumption; and he argues that if the Czar of Muscovy would order his people to wear stockings, and we could supply them, the poor might then be set to work. The increase of consumption, all over the world, is produced by



MICROSCOPIC APPEARANCE OF THE FLAX FIBER.

the inventions which diminish the cost of production. England now makes linen cloth here cheaper than it can be sent to her from abroad; and the result is that in 1853 she exported linen manufactures to the extent of six million pounds sterling; and employed a hundred thousand persons in the manufacture. In the flax-mill of Messrs. Marshall, at Leeds, England, where all the operations of spinning are carried on in one enormous room, seventy thousand pounds of flax are worked up weekly into yarn. The question of flax-cultivation in Great Britain and the United States has been much agitated of late years. It is not an easy matter to provide for the demand of the flax-manufacturers. The great flax-mill at Leeds would require the flax-

cultivation of six thousand acres, to keep its spindles at work for one year.

One striking peculiarity of the manufacturing processes of the present day, is, that comparatively little is wasted, the material after subserving a useful purpose in one form, being worked over and made valuable in another and different form. The conversion of old linen and cotton-rags into paper is an illustration familiar to every one, but the utilization of old woollen-rags, which can not be used for the manufacture of paper, and have generally been considered as entirely worthless, except for manure, is both novel and interesting. The following graphic description of the economic applications of this variety of refuse material is copied from a recent publication.*

In the somewhat hilly district of Yorkshire, between Huddersfield and Leeds stands the little town of Dewsbury. The stranger on alighting from the rail-way car is struck with the immense warehouses built by the rail-way company. For such small stations these are mysterious erections. But if he enters the warehouses, he will find piled up hundreds of bales, containing the cast-off garments of Great Britain and the continent of Europe. Here, in fact, from all parts of the world, are brought the tattered remains of the clothes, some of which have been worn by royalty, as well as by peers and peasants. The rich broad-cloth of the nobles here commingles with the livery of their servants, and the worsted blouses of French republicans; while American undershirts, pantaloons, and all other worsted and woollen goods, may be there found, all reduced to one common level, and known by one common application of "rags." The walls of the town are placarded with placards, announcing public auctions of "Scotch shoddies," "mungoes," "rags," and such like articles of mer-

* "Art and Industry," New York, 1854.

chandise, and buyers may be seen examining with great attention the various bales; some of which are assorted into "whites," "blue-stockings," "black-stockings," "carpets," "shawls," "stuffs," "skirtings," "linseys," "black-cloth," etc. etc. The prices which these old worn-out articles bring is surprising to the uninitiated. Old stockings will realize from £7 to £10 a ton; while white flannels will sometimes sell for as much as £20 a ton, or even more. The "hinds," or black cloth when clipped free from all seams and threads, are worth from £20 to £30 per ton, while the rubbish consisting of seams, linseys, and indescribables, are purchased by the chemist for the manufacture of prussiate of potash for from £2 to £3 per ton.

It will be seen that *assorting* these old woollens is equally important with the assorting of the different qualities of new wool; and there is the additional consideration of colors to render assorting still more necessary. In the assortment, the flannel rags are the most valuable, the stockings are the next in value to the flannels, on account of the strength and elasticity of the wool. The peculiar stitch or bend of the worsted in stocking manufacture, and the hot water and washing to which they are subjected during their stocking existence, have the effect of producing a permanent elasticity which no new wool can be found to possess. Hence old stockings are always in great demand.

All the various assortments are next converted into shoddy, which is the general term for the wool produced by grinding, or more technically the "pulling up" the materials. The usual method of effecting this, is to first carefully assort the rags, so as to see that not a particle of cotton remains on them, and then to pass them through a rag machine. This consists of a cylinder, with steel teeth, set in back apart from each other, and standing

out from each other. This cylinder revolves five hundred times in a minute, and the rags, drawn in, through an arrangement of rollers, are brought close to the surface of the revolving cylinder, and by the action of the steel teeth are completely torn into wool. Half a ton of rags can in this way be pulled up in ten hours. The best varieties of the white wool so produced, are worked up into blankets, or light-colored goods, while the dark-colored wool is worked into all kinds of coarse cloths, carpets, etc., which are dyed any dark color, so as to hide the various colors of the old fabrics. It is also mixed with new wool, in such proportions as its quality will admit without deteriorating the sale of the material. The wool produced by pulling up the broadcloth rags, is used in nearly all the Yorkshire superfine cloths, and some very extensively. It produces a cloth somewhat inferior to the best broadcloth, in durability, but for finish and appearance, when first made up, it is nearly equal. This business of working up old woollen rags, has now become in England one of great extent and importance. It is generally known as the Dewsbury trade, as the town of Dewsbury has by means of it grown from a little village to a city of 30,000 inhabitants, and immense fortunes have been made by this extraordinary transformation of old garments into new.

Having thus noticed the leading processes of the manufacture of cotton, of wool, of silk, of linen, we may conclude this chapter with a brief mention of the art that gives to many of the fabrics produced their chief beauty—the art of printing cloth in colors. This art applies to the finest as well as the commonest productions of the loom; and the science of the dyer, the beauty of his patterns, and the perfection of his machinery, have now given us great eminence in this department of industry.

There is a striking, although natural parallel, between

printing a piece of cloth and printing a sheet of a book, or a newspaper. Block-printing is the impress of the pattern by hand; as block-books were made four centuries ago. We have no block-books now; for machinery has banished that tedious process. But block-printing is used for costly shawls and velvets, which require to have many colors produced by repeated impress from a large number of blocks, each carrying a different color. Except for expensive fabrics, this mode is superseded by block-printing with a sort of press, in which several blocks are set in a frame. Here, again, is somewhat of a similarity to the operation of the book-press. Lastly, we have cylinder-printing, resembling the rapid working of the book-printing machine, each producing the same cheapness. As the pattern has to be obtained from several cylinders, each having its own color, there is great nicety in the operation; and the most beautiful mechanism is necessary for feeding the cylinder with color; moving the cloth to meet the revolving cylinder; and giving to the cylinder its power of impression. But those who witness the operation see little of the ultimate effect to be obtained in the subsequent processes of dyeing. Fast colors are produced by the use in the pattern of substances called mordants; which may be colorless themselves but receive the color of the dye-bath, which color is only fixed in the parts touched by the mordant, and is washed out from the parts not touched. When what is called a substantive color is at once impressed upon the white cloth, much of the beauty is also derived from subsequent processes. The chemist, the machinist, the designer, and the engraver—science and art—set the calico-printing works in activity; and the carrying on these complicated processes can only be profitably done upon a large scale. No direct enumeration can be made of the employments that are required merely to produce the dyes with which the calico-

printer works. The mineral and vegetable kingdoms, and even the animal kingdom, combine their natural productions in the colors of a lady's dress. The sulphur-miner of Sicily, the salt-worker of Austria or Turk's Island, the hewer of wood in the Brazils, the Negro in the indigo plantations of the East and West Indies, the cultivator of madder in France, and the gatherer of the cochineal insect in Mexico, are all laborers for the calico print-works. The discoveries of science, in combination with the experience of practice, has set all this industry in motion, and has given a value to innumerable productions of nature which would otherwise be useless and unemployed. But these demands of manufactures do more; they create modes of cultivation which are important sources of national prosperity. Jean Althen, a Persian of great family, bred up in every luxury, became a slave in Anatolia, when Kouli-Khan overthrew the Persian empire. For fourteen years he worked in the cotton and madder-fields. He then escaped to France, carrying with him some madder-seeds. Long did he labor in vain to attract the attention of the government of Louis XV. to his plans. At length, having spent all the fortune which he had acquired by marriage with a French heiress, he obtained the patronage of the Marquis de Caumont, in his attempts to introduce the cultivation of madder into the department of Vaucluse. His life was closing in comparative indigence when a new branch of industry was developed in his adopted country. The district in which he created a new industry has increased a hundred fold in value. The debt of gratitude was paid by a tablet to his memory, erected sixty years after he was insensible to human rewards. We starve our benefactors when they are living, and satisfy our consciences by votive monuments. Althen's daughter died as poor as her father. The tablet was erected at Avignon when the family was extinct.

There is a process connected with the production of clothing which we must briefly refer to, as one of the signal examples of the axiom of our title—"Knowledge is Power."

Let us suppose that chemistry had not discovered and organized the modes in which bleaching is performed; and that the thousands of millions of yards of cloth which we wear in this country had still to be bleached as bleaching was accomplished in the last century. All linens were then sent from England and other parts of Europe to Holland to be bleached.* The Dutch steeped the bundles of cloth in ley made by water poured upon wood-ashes—then soaked them in buttermilk—and finally spread them upon the grass for several months. These were all natural agencies which discharged the coloring matter without any chemical science. It was at length found out that sulphuric acid would do the same work in one day which the buttermilk did in six weeks; but the sun and the air had still to be the chief bleaching powers. A French chemist then found out that a new gas, chlorine, would supersede the necessity for spreading out the linen for several months: and so the

* It may not be foreign to our subject to correct at this point an error which has been widely extended, and found credence with many persons, viz. that which ascribes to Holland the manufacture of the nicer varieties of linen. The facts are these: During the sixteenth and seventeenth centuries almost all the linen goods manufactured in Europe were sent to Holland, in Holland, to be bleached, and the bleaching of this place was regarded as an indispensable compliment of all high-priced linens. These goods for the most part passed into the hands of the Dutch, who, having first given them "*Blanc de Haarlem*," sold them as the manufactured products of Holland. In the latter part of the eighteenth century, when manufacturers found out the secret of bleaching, and ceased to send their goods to Holland. The imprint, however, of the Dutch, *Blanc de Haarlem*, that its use is continued even to the present day, being given to the linen fabrics.

acres of bleaching-ground which were then used in England and Scotland—for the practice of sending the brown and yellow cloth to Holland had been discontinued—were free for cultivation. But the chlorine was poisonous to the workmen, and imparted a filthy odor to the cloth. Chemistry again went to work, and finally obtained the chlorid of lime, which is the universal bleaching powder of modern manufactures. What used to be the work of eight months is now accomplished in an hour or two; and so a bag of dingy raw cotton may be in Alabama on the first day of the month, and be converted into the whitest calico before the month is at an end.

CHAPTER XX.

~~BOOKING-MACHINE.—THE STOCKING-FRAME.—THE CIRCULAR HOSIERY-MACHINE
HATS.—GLOVES.—FANS.—LACE MANUFACTURE.—BOBBINET-MACHINE.—FIN-EM-
ING.—STITCHES.—BUTTONS.—COTTS.—MATCHES.—ENVELOPS.~~

BEFORE the invention of the first stocking-machine, in the year 1589, by William Lee, an English clergyman, none but the very rich wore stockings, and many of the most wealthy went without stockings at all, that part of dress being sewn together by the tailor, or their legs being covered with bandages of cloth. The covering for the leg was called a "nether-stock," or lower stocking. Philip Stubbes, a tremendous puritanical declaimer against every species of luxury, thus describes the expensive stockings of his time, 1585 :

"Then have they nether-stocks to these hosen, not of cloth (though never so fine), for that is thought too base, but of jarnsey, worsted, crewell, silk, thread, and such like, or else at the least of the finest yarn that can be got, and so curiously knit with open seam down the leg, with quirks and clocks about the ancles, and sometime, haply, interlaced with gold or silver threads, as is wonderful to behold. And to such impudent insolency and shameful outrage it is now grown, that every one, almost, though otherwise very poor, having scarce forty shillings of wages by the year, will not ~~sick~~ to have two or three pair of these silk nether-stocks, ~~or else~~ of the finest yarn that may be got, though the price ~~of them~~ be a ryall, or twenty shillings, or more, as com-

monly it is; for how can they be less, when as the very knitting of them is worth a noble or a ryall, and some much more? The time hath been when one might have clothed his body well for less than a pair of these nether-stocks will cost."

It is difficult to understand how those who had only forty shillings a year wages could expend twenty shillings upon a pair of knit stockings. But it is quite clear they were for the rich only; and that very few persons were employed in knitting and embroidering stockings.

William Lee struggled to make stockings cheap. He made a pair of stockings by the frame, in the presence of King James I.; but such was the prejudice of those times, that he could get no encouragement for his invention. His invention was discountenanced, upon the plea that it would deprive the industrious poor of their substance. He went to France, where he met with no better success, and died at last of a broken heart. The great then *could* discountenance an invention, because its application was limited to themselves. *They* only wore stockings: the poor who made them had none to wear. Stockings were not cheap enough for the poor to wear, and therefore they went without. Of the millions of people now in this country, how few are without stockings! What a miserable exception to the comfort of the rest of the people does it appear when we see a beggar in the streets without stockings! We consider such a person to be in the lowest stage of want and suffering. Two centuries ago, not one person in a thousand wore stockings; one century ago, not one person in five hundred wore them; now, not one person in a thousand is without them. Who made this great change in the condition of the people of almost all civilized countries? William Lee—who died at Paris of a broken heart. And why did he die of grief and penury? Because the people of his

own days were too ignorant to accept the blessings he had prepared for them.

We ask with confidence, had the terror of the stocking-frame any real foundation? Were any people thrown out of employment by the stocking-frame?

"The knitters in the sun,
And the free maids who weave their thread with bones,"

as Shakspeare describes the country lasses of his day, had to *change* their employment; but there was far more employment for the makers of stockings, for then every one began to wear stockings.

The hosiery manufacture furnishes employment to many persons besides those that work at the stocking-machine. The frame-worker, in many cases, makes the knit-work in a piece adapted for a stocking, and does not make a finished stocking; the seamer makes the stocking out of the piece so produced. When we speak of the stocking-frame, we speak of a machine which knits every article of hosiery. In this manufacture there were employed, in 1851, in Great Britain, sixty-five thousand five hundred persons, of whom thirty thousand were females.

Suppose that the ignorance and prejudice which prevailed at the time of James I. upon the subject of machinery had continued to the present day; and that not only the first stocking-frame of William Lee had never been used, but that all machines employed in the manufacture of hosiery had never been thought of; and they could not have been thought of if the first machines had been put down. The greater number of us, in that case, would have been without stockings.

But there would have been a greater evil than even this. We might all have found substitutes for stockings, or have gone without them. But the progress of ingenuity would

have been stopped. The inventive principle would have been destroyed.

We have not reached the end of our career of improvement. Civilization is not destined to run a backward race. William Lee's stocking-frame worked well for two centuries and a half. One of the most beautiful contrivances of our time has now greatly superseded it. The circular hosiery machine—more properly called a machine for manufacturing “looped fabrics”—works at such a rate that one girl attending upon the revolutions of this wonderful instrument can produce in one day the material for two hundred and forty pairs of stockings. She turns a little handle, with the ease with which she would turn a barrel-organ; and, as the machine revolves, hundreds of needles catch the thread and loop it into the chain which forms the stocking-cloth, or it makes the fashioned stocking.

As the nether-stocks of our English ancestors were for the great and wealthy, so were their hats. Old Stubbs writes, “Sometimes they use them sharp on the crown, peaking up like the spear or shaft of a steeple, standing a quarter of a yard above the crown of their heads, some more, some less, as please the fantasies of their inconstant minds. Other some be flat and broad on the crown, like the battlements of a house. Another sort have round crowns, sometimes with one kind of band, sometimes with another, now black, now white, now russet, now red, now green, now yellow, now this, now that, never content with one color or fashion two days to an end. And thus in vanity they spend the Lord his treasure, consuming their golden years and silver days in wickedness and sin. And as the fashions be rare and strange, so is the stuff whereof their hats be made divers also; for some are of silk, some of velvet, some of taffeta, some of sarsanet, some of wool, and, which is more curious, some of a certain kind of fine hair; these

they call beaver hats, of twenty, thirty, or forty shillings price, fetched from beyond the seas, from whence a great sort of other vanities do come besides." Here, then, we see that the beaver hat was in those days an article of great price. The commonalty had their "plain statute caps" of wool. In our time the beaver hat was the common wear of the middle classes until the last few years, when the cheaper silk hat became almost universal. Hats have, therefore, become intimately associated with the material plush, produced by the loom.

The manufacture of gloves is connected, in a very large department, with the hosiery manufactory. The use of thread gloves and cotton gloves has had the effect, in some degree, of lessening the consumption of leather gloves. The importation of leather gloves and mitts was prohibited into Great Britain until 1825. She now imports three million pairs annually; and the home manufacture, instead of being ruined, as was predicted, was never so prosperous. The French gloves, once so superior, have improved the English by the natural force of competition; and the English manufacturers not only purchase better leather than formerly, but the cottage-workwomen that labor in the glove districts have become neater and more careful sewers. The consumption of gloves has ceased to be exclusively for the rich. The perfumed and embroidered glove of the sixteenth century is no longer required. The use of gloves has become universal among both sexes of the middle classes. The female domestic would think it unbecoming to go to church without her gloves; and the well-dressed artizan holds it nothing effeminate to use a covering for his hands, which his forefathers thought a distinguishing appurtenance of the high-born and luxurious.

Fan-making in France is a large branch of manufacture. In the Jury Report on the Exhibition of Industry in 1851,

there is a notice of the fan-trade of Paris, which is curious as showing the joint influences upon cheapness of machinery, and of the multiplication of works of art by engraving. The fan-makers of Paris in 1847 employed five hundred and seventy-five workpeople—the number of the sexes being pretty equally divided. “The men, were for the most part, copper-plate engravers and printers, lithographic draughtsmen and printers, painters, and colorers; the women were mounters, illuminators, painters, colorers, and overlookers. In twenty years it appears that the produce in fans had increased in value nearly threefold, while the number of workpeople had diminished one half. This change is attributed to the employment of machinery, especially of the fly press, in stamping out and embossing the ribs, and the extensive employment of chromo-lithography, an art not practiced at the former period. By these means the French have been enabled greatly to increase their exports by the production of cheap fans, to compete with those made by the Chinese.”

Dekker, in his “Gull’s Hornbook,” printed in 1609, advises the gallant of his day to exhibit a “wrought handkerchief.” A “handkerchief, spotted with strawberries,” was Othello’s first gift to Desdemona. It was an embroidered handkerchief, such as is produced in the present day at Cairo by the Egyptian ladies in their private apartments. The embroidered shirts of the time of Elizabeth are thus noticed by Stubbes:

“These shirts (sometimes it happeneth) are wrought throughout with needle-work of silk, and such like, and curiously stitched with open seam, and many other knacks besides, more than I can describe; in so much as I have heard of shirts that have cost some ten shillings, some twenty, some forty, some five pound, some twenty nobles, and (which is horrible to hear) some ten pound apiece.”

The embroidery-frame was in time superseded by the lace-pillow, which is stated to have been first used in Saxony in the sixteenth century.

The laces of France form a history of their own, as well they should, 200,000 women gaining employment by their manufacture. They are all hand-made—that is, with bobbins, upon a small, portable cushion—except at Alençon, where the needle is employed, and the work done on parchment. The different appellations given to them are derived from the district in which they are made—Bayeux, Chantilly, Lille, Arras, Mirecourt, Du Pay, Boilleul, Alençon; and although made in the same way, they are instantly recognized by the peculiar style of the district. The berthes and coiffures of point d'Alençon, collars of guipure and point à l'aiguille, have the most delicate and graceful patterns, and are of the finest possible web. The point d'Alençon is worked entirely with the needle, and is the only lace made now in France of pure linen thread—the thread being worth from 100*f.* to 120*f.* per pound. It is the richest, the finest of all, and the strongest, and consequently its price is the highest. It is a lace of very ancient date, having been introduced into France by Venetian workmen, in 1660, and is different from other laces—for, while in other fabrics only one worker is required to make the richest piece, the Alençon requires from fourteen to sixteen different workers for the smallest size—even a quarter of a yard, and the most simple pattern.

Until the present century no lace was heard of but pillow-lace—a domestic manufacture, of which Honiton, England, was the most famous seat. A stocking-weaver of Great Britain adapted his stocking-frame to the making of lace about 1770; and the bobbin-frame was invented in 1809. It was never extensively used till the expiration of the patent; and the produce of this machine was kept

at so high a price by the patentees that it interfered little with the labor of the lace-makers in the cottages of England.

But a time was coming when as much bobbinet as the patentees of the first frame charged twenty dollars for would be sold for fifty cents; and when, as a necessary consequence of this cheapness, lace-making as a domestic employment would wholly cease, or be confined to the production of an expensive article, supposed to be superior to machine-made lace. That the old hand-labor could compete with the machine was an impossibility. Lace of an ordinary figured pattern used to be made on the pillow at the rate of about three meshes per minute. A bobbinet machine will produce similar lace at the rate of twenty-four thousand meshes per minute, one person only being required to wait upon the machine. Those who have watched the cottage lace-maker, working with her bobbins and pins, were unable, without long observation, to understand the principle upon which she intertwined the threads. But to explain the more rapid working of the bobbinet machine would require such a minute acquaintance with all its parts as belongs to the business of the practical machinist, and which words are inadequate to exhibit.

Instead of England being now supplied with lace from France and Belgium, she is now an exporting lace-country. In 1848 she exported cotton lace and net to the amount of £363,255; in 1853 to the amount of £596,578.

There is an article employed in dress which is at once so necessary and so beautiful that the highest lady in the land uses it, and yet so cheap that the poorest laborer's wife is enabled to procure it. The quality of the article is as perfect as art can make it; and yet, from the enormous quantities consumed by the great mass of the people, it is made

so cheap that the poor can purchase the best kind, as well as the rich. It is an article of universal use. United with machinery, many hundreds, and even thousands are employed in making it. But if the machinery were to stop, and the article were made by human hands alone, it would become so dear that the richest only could afford to use it; and it would become at the same time so rough in its appearance that those very rich would be ashamed of using it. The article we mean is a pin.

It is not necessary for us to describe the machinery used in pin-making, to make the reader comprehend its effects. A pin is made of brass. We have seen how metal is obtained from ore by machinery, and, therefore, we will not go over that ground. But suppose the most skillful workman has a lump of brass ready by his side, to make it into pins with common tools—with a hammer and with a file. He beats it upon an anvil, till it becomes nearly thin enough for his purpose. A very fine hammer, and a very fine touch must he have to produce a pin of any sort—even a large coarse pin! But the pin made by machinery is a perfect cylinder. To make a metal, or even a wooden cylinder of a considerable size, with files and polishing, is an operation so difficult that it is never attempted; but with a lathe and a sliding rest it is done every hour by a great many workmen. How much more difficult would it be to make a perfect cylinder the size of a pin? A pin hammered out by hand would present a number of rough edges that would tear the clothes, as well as hold them together. It would not be much more useful or ornamental than the skewer of bone with which the woman of the Sandwich Islands fastens her mats. But the wire of which pins are made acquires a perfect cylindrical form by the simplest machinery. It is forcibly drawn through the circular holes of a steel plate; and the hole being smaller and

smaller each time it is drawn through, it is at length reduced to the size required.

In England and Europe at the present time, the head of a pin is formed of a small piece of wire twisted round, so as to fit upon the other wire which constitutes the body of the pin. The cutting and pointing of the pins are also the result of separate operations; but in the United States, machines have been invented which stamp the head at once from the same piece of wire which constitutes the body of the pin, at the same time cutting and polishing the points. Invention has not, however, rested here in the operation of pin-making, and machines have been contrived by which the pins are stuck into papers and folded up, an equal number being arranged with mathematical accuracy in each paper.

It is by these processes—by these combinations of human labor with mechanical power—that it occurs that a paper of pins can be bought for a few cents, and that, therefore, four or five thousand pins may be consumed in a year by the most economical housewife, at a much less price than fifty pins of a rude make cost two or three centuries ago. A woman's allowance was formerly called her *pin-money*—a proof that the pins were a sufficiently dear article to make a large item in her expenses. If pins were now to cost a cent apiece, instead of being fifty for a cent, the greater number of females would adopt other modes of fastening their dress, which would probably be less neat and convenient than pins. No such circumstance could happen while the machinery of pin-making was in use.

Needles are not so cheap as pins, because the material of which they are made is more expensive, and the processes can not be executed so fully by machinery. But without machinery how could that most beautiful article, a *fine needle*, be sold at the rate of three for a cent.

As in the case of pins, machinery is at work at the first

formation of the material. Without the tilt-hammer, which beats out the bar of steel, first at the rate of ten strokes a minute, and lastly at that of five hundred, how could that bar be prepared for needle-making at any thing like a reasonable price? In all the processes of needle-making, labor is saved by contrivance and machinery. What human touch, without a machine would be accurate enough to make the eye of the finest needle, through which the most delicate silk is with difficulty passed? There are two needles to be formed out of one piece of wire; in the previous preparation of which the eyes are marked. The workman, holding in his hand several wires, drops one at a time on the bed-iron of the machine, adjusts it to the die, brings down the upper die upon it by the action of the foot, and allows it to fall into a little dish when done. This he does with such rapidity that one stamper can stamp four thousand wires, equivalent to eight thousand needles in an hour.

Needles are made in such large quantities, that it is even important to save the time of the child who lays them all one way when they are completed. Mr. Babbage, of England, who is equally distinguished for his profound science and his mechanical ingenuity, has described this process as an example of one of the simplest contrivances which can come under the denomination of a tool. "It is necessary to separate the needles into two parcels, in order that their points may be all in one direction. This is usually done by women and children. The needles are placed sideways in a heap, on a table, in front of each operator. From five to ten are rolled toward this person by the forefinger of the left hand; this separates them a very small space from each other, and each in its turn is pushed lengthways to the right or to the left, according as its eye is on the right or the left hand. This is the usual process, and in it every needle

passes individually under the finger of the operator. A small alteration expedites the process considerably; the child puts on the forefinger of its right hand a small cloth cap or finger-stall, and rolling from the heap from six to twelve needles, it keeps them down by the forefinger of the left hand; while it presses the forefinger of the right hand gently against the ends of the needles, those which have their points toward the right hand stick into the finger-stall; and the child, removing the finger of the left hand, allows the needles sticking into the cloth to be slightly raised, and then pushes them toward the left side. Those needles which had their eyes on the right hand do not stick into the finger-cover, and are pushed to the heap on the right side previous to the repetition of the process. By means of this simple contrivance, each movement of the finger, from one side to the other, carries five or six needles to their proper heap; whereas, in the former method, frequently only one was moved, and rarely more than two or three were transported at one movement to their place."

A large number of people are employed in the manufacture of buttons. In the manufacture of a single button there is great division of labor among piercers, cutters, stampers, gilders, and burnishers. The shank of a button is made by very complicated machinery as a distinct class of manufacture, and the button-makers buy the shanks. It has been stated that three firms in Birmingham, England, annually make six hundred million button-shanks.

The application of machinery, or of peculiar scientific modes of working, to such apparently trifling articles as pins, needles, buttons, and trinkets, may appear of little importance. But let it be remembered, that the manufacture of such articles furnishes employment to many thousands of our fellow-countrymen; and, enabling us to supply other nations with these products, affords us the means of

receiving articles of more intrinsic value in exchange. In 1853, the English exports of hardware and cutlery amounted to more than three millions and a half sterling. No article of ready attainment, and therefore of general consumption, whether it be a laborer's spade or a child's marble, is unimportant in a commercial point of view. The wooden figures of horses and sheep that may be bought for a few cents in the toy-shops furnish employment to cut them, during the long winter nights, to a large portion of the peasantry of the Tyrol. The Swiss peasant cuts a piece of white wood into a boy or a cottage, as he is tending his herd on the side of a mountain. These become considerable articles of export. In the town of Sonneberg, near the forest of Thuringia, Germany, four thousand inhabitants are principally employed in the toy-trade, and also find employment for the neighboring villagers. Mr. Osler, an English manufacturer of Birmingham, some years ago, addressing a Committee of the House of Commons upon the subject of his beads and trinkets, said—"On my first journey to London, a respectable-looking man in the city asked me if I could supply him with dolls' eyes; and I was foolish enough to feel half offended. I thought it derogatory to my new dignity as a manufacturer to make dolls' eyes. He took me into a room quite as wide and perhaps twice the length of this room (one of the large rooms for Committees in the House of Commons), and we had just room to walk between stacks, from the floor to the ceiling, of parts of dolls. He said, 'These are only the legs and arms—the trunks are below.' But I saw enough to convince me that he wanted a great many eyes; and as the article appeared quite in my own line of business, I said I would take an order by way of experiment; and he showed me several specimens. I ~~accepted~~ the order. He ordered various quantities and of ~~various sizes~~ and qualities. On returning to my hotel, I

found that the order amounted to upward of two thousand dollars.

Mr. Osler tells this story to show the importance of trifles. The making of dolls' eyes afforded subsistence to many ingenious workmen in glass toys; and in the same way the most minute and apparently insignificant article of general use, when rendered cheap by chemical science or machinery, produces a return of many thousand pounds, and sets in motion labor and laborers. Without the science and the machinery, which render the article cheap, the laborers would have had *no* employ, for the article would not have been consumed. What a pretty article is a common tobacco-pipe, of which millions are used! It is made cheap and beautiful in a mold—a machine for copying pipes. If the pipe were made without the mold, and other contrivances, it would cost at least a shilling instead of a cent: the tobacco-smoker would go without his pipe, and the pipe-maker without his employment.

Among articles of great demand that have become of importance, though apparently insignificant, in our own day, there is nothing more worthy of notice than the Friction or Lucifer Match. About twenty years ago chemistry abolished the tinder-box; and the burnt rag that made the tinder went to make paper. Slowly did the invention spread. The use of the match is now so established that machines are invented to prepare the splints. In New York, one match manufactory annually cuts up a large raft of timber for matches. The English matches are generally square, and thus thirty thousand splints are cut in a minute. The American matches are round; and the process of shaping being more elaborate, four thousand five hundred splints are cut in a minute. We will follow a bundle of eighteen hundred of thin splints, each four inches long, through its conversion into three thousand six hundred matches.

Without being separated, each end of the bundle is first dipped into sulphur. When dry, the splints, adhering to each other by means of the sulphur, must be parted by what is called dusting. A boy, sitting on the floor with a bundle before him, strikes the matches with a sort of mallet on the dipped ends till they become thoroughly loosened. They have now to be plunged into a preparation of phosphorus or chlorate of potash, according to the quality of the match. The phosphorus produces the pale, noiseless fire; the chlorate of potash the sharp crackling illumination. After this application of the more inflammable substance, the matches are separated, and dried in racks. Thoroughly dried, they are gathered up again into bundles of the same quantity, and are taken to the boys who cut them; for the reader will have observed that the bundles have been dipped at each end. There are few things more remarkable in manufactures than the extraordinary rapidity of this cutting process and that which is connected with it. The boy stands before a bench, the bundle on his right hand, a pile of empty boxes on his left. The matches are to be cut, and the empty boxes filled, by this boy. A bundle is opened; he seizes a portion, knowing by long habit the required number with sufficient exactness; puts them rapidly into a sort of frame, knocks the ends evenly together, confines them with a strap which he tightens with his foot, and cuts them in two parts with a knife on a hinge, which he brings down with a strong leverage. The halves lie projecting over each end of the frame; he grasps the left portion and thrusts it into a half open box, which slides into an outer case; and he repeats the process with the matches on his right hand. This series of movements is performed with a rapidity almost unexampled; for in this way, two hundred thousand matches are cut, and two thousand boxes filled in a day, by one boy.

It is a law of this manufacture that the demand is greater in the summer than in the winter. The increased summer demand for the matches shows that the great consumption is among the masses—the laboring population—those who make up the vast majority of the contributors to duties of customs and excise. In the houses of the wealthy there is always fire; in the houses of the poor, fire in summer is a needless hourly expense. Then comes the match to supply the want—to light the afternoon fire to boil the kettle. It is now unnecessary to run to the neighbor for a light, or, as a desperate resource, to work at the tinder-box. The matches sometimes fail, but they cost little, and so they are freely used, even by the poorest. Their value was sufficiently shown when an English officer in camp at Sebastopol recently wrote home that no want was greater than that of the ready means of procuring fire and light, and that he should hold a box of matches cheap at half a crown.

We may notice one other article of almost universal use, which is of very recent introduction—the envelop. It is a labor-saving contrivance for the writer of letters. The use of the envelop has been mainly created by cheap postage. A machine has been invented for their manufacture, which is able to produce twenty-five thousand envelops in a single day.

CHAPTER XXI.

LABOR-SAVING CONTRIVANCES.—THE NICK IN TYPES.—CASTING SHOT.—CANDLE-DIPPING.—TIRING A WHEEL.—GLOBE-MAKING.—DOMESTIC AIDS TO LABOR.—AIDS TO MENTAL LABOR.—EFFECTS OF SEVERE BODILY LABOR ON HEALTH AND DURATION OF LIFE.

WE drew attention in the last chapter to a particular process in needle-making—the sorter's sheath—to show that great saving of labor may be effected by what is not popularly called machinery. In modern times, wherever work is carried on upon a large scale, the division of labor is applied; by which one man attending to one thing learns to perform that one thing more perfectly than if he had attended to many things. He thus saves a considerable portion of the whole amount of labor. Every skillful workman has individually some mode of working peculiar to himself, by which he lessens his labor. An expert blacksmith, for instance, will not strike one more blow upon the anvil than is necessary to produce the effect he desires. A compositor, or printer who arranges the types, is a swift workman when he makes no unnecessary movement of his arms or fingers in lifting a single type into what is called his composing-stick, where the types are arranged in lines. There is a very simple contrivance to lessen the labor of the compositor, by preventing him putting the type into his composing-stick the wrong side outward. It is a nick, or two, or three nicks, on the side of the type which corresponds with the lower side of the face of the letter. By this nick or nicks he is enabled to see by one glance of his eye on which side

the letter is first to be grasped, and then to be arranged. If the nick were not there he would have to look at the face of every letter before he could properly place it. This is a labor-saving contrivance; and if the labor were not thus saved, two compositors would certainly be required to do the work of one; and the natural and inevitable effect would be that, as the funds for the payment of the compositor's labors would not be increased, the wages of each compositor would be diminished by one half. The new labor that would be required would enter into competition with the old labor, and depreciate its value, because each individual laborer had lost one half of his efficiency.

Contrivances to economize labor, such as that of the needle-sorter's sheath, and the nicks in the type of the compositor, are constantly occurring in manufactures.

If the small shot which is used by sportsmen were each cast in a mold, the price would be enormous; but by pouring the melted lead, of which the shot is made, through a sort of cullender, placed at the top of a tower, high enough for the lead to cool in its passage through the air, before it reaches the ground, the shot is formed in a spherical or round shape by the mere act of passing through the atmosphere. Some of the shot thus formed are not perfectly spherical—they are pear-shaped. If the selection of the perfect from the imperfect shots were made by the eye, or the touch, the process would be very tedious and insufficient, and the price of the article much increased. The simplest contrivance in the world divides the bad from the good. The shots are poured down an inclined plane, and, without any trouble of selection, the spherical ones run straight to the bottom, while the pear-shaped ones tumble off on one side or the other of the plane.

As the construction of lofty towers for the manufacture of shot is attended with great expense, a plan has recently

been devised by which they may be dispensed with, and consequently the cost of production lessened. The liquid molten lead is made to descend through an upright circular pipe, arranged over a reservoir of water, and near the bottom is a fan-wheel, which produces a constant current of air that meets the lead in its descent, and while it tends to decrease the rapidity of its fall in some degree, it also abstracts sufficient caloric to solidify the shot effectually. The upward blast of air also tends to cause the particles of lead to assume a perfectly spherical form.

In speaking of such contrivances we are constantly passing over the narrow line which separates them from what we popularly term machinery. Let us take an example of the readiness with which a small aid to manual labor gradually becomes perfected into a machine, requiring little impulse from human action. The dippers of candles have gradually, in small establishments, made several improvements in their art for the purpose of diminishing labor. They used to hold the rods between their fingers, dipping three at a time; they next connected six or eight rods together by a piece of wood at each end, having holes to receive the rods; and they now suspend the rods so arranged upon a sort of balance, rising and falling with a pulley and a weight, so as to relieve the arms of the workman almost entirely, while the work is done more quickly and with more precision. But in large candle-factories the principle is carried much further. The wicks, having been cut by machinery of the requisite length, instead of being cut one at a time, are arranged upon a rod. For the sort of candle called "twelves," or twelve to a pound, twenty-four wicks are suspended on one of these rods. Thirty rods are connected together in a frame, which thus holds seven hundred and twenty wicks. Attached to the machine are thirty-six of these frames. The whole number of

wicks is therefore twenty-five thousand nine hundred and twenty. The machine, as it revolves, dips one frame into a vessel of melted tallow; and so on till the thirty-six frames have been once dipped—and the process is continued till the candles are fully formed. One man and a boy complete this number of candles in a working-day of ten hours.

Walking by a wheelwright's shop in some quiet village, did our readers ever see the operation of "tiring" a wheel? The wood-work of the wheel is entirely formed; but the joints of the felloes are imperfectly fitted together. They used to be drawn close by separate straps of iron applied with great labor. The wheel rests upon some raised bricks. Out from the forge rush three or four men bearing a red-hot iron hoop. It is laid upon the outer rim of the wood-work, burning its way as it is hammered down with the united force of the wheelwrights. When it is nearly fitted, floods of water are thrown upon it, till it no longer burns. The knowledge of the simple fact that the iron shrinks as it cools, and thus knits the whole wheel into a firm body, taught the wheelwright how to accomplish the difficult task of giving the last strength to his wheel with the least possible labor.

The manufacture of a globe offers an example of the production of a most beautiful piece of work by the often repeated application of a series of processes, each requiring very little labor. A globe is not a ball of wood; but a hollow sphere of papers and plaster. The mold, if we may so express it, of a globe is turned out of a piece of wood. This sphere need not be mathematically accurate. It is for rough work, and flaws and cracks are of little consequence. This wooden ball has an axis, a piece of iron wire at each pole. And here we may remark, that, at every stage of the process, the revolution of a sphere upon

its axis, under the hands of the workman, is the one great principle which renders every operation one of comparative ease and simplicity. The labor would be enormously multiplied if the same class of operations had to be performed upon a cube. The solid mold, then, of the embryo globe is placed on its axis in a wooden frame. In a very short time a boy will form a pasteboard globe upon its surface. He first covers it entirely with strips of strong paper, thoroughly wet, which are in a tub of water at his side. The slight inequalities produced by the over-lapping of the strips are immaterial. The saturated paper is not suffered to dry; but is immediately covered over with a layer of pasted paper, also cut in long narrow slips. A third layer of similarly pasted paper—brown paper and white being used alternately—is applied; and then, a fourth, a fifth, and a sixth. Here the pasting process ends for globes of moderate size. For the large ones it is carried further. This wet pasteboard ball has now to be dried—placed upon its axis in a rack. If we were determined to follow the progress of this individual ball through all its stages, we should have to wait a fortnight before it advanced another step. But in a large factory there are many scores of globes all rolling onward to perfection; and thus we may witness the next operation performed upon a pasteboard sphere that began to exist some weeks earlier, and is now hard to the core.

The wooden ball, with its solid paper covering, is placed on its axis. A sharp cutting instrument, fixed on a bench, is brought into contact with the surface of the sphere, which is made to revolve. In less time than we write, the pasteboard ball is cut in half. There is no adhesion to the wooden mold, for the first coating of paper was simply *wetted*. Two bowls of thick card now lie before us, with a small hole in each, made by the axis of the wooden ball.

But a junction is very soon effected. Within every globe there is a piece of wood—we may liken it to a round ruler—of the exact length of the inner surface of the sphere from pole to pole. A thick wire runs through this wood, and originally projected some two or three inches at each end. This stick is placed upright in a vice. The semi-globe is nailed to one end of the stick, upon which it rests, when the wire is passed through its center. It is now reversed, and the edges of the card rapidly covered with glue. The edges of the other semi-globe are instantly brought into contact, the other end of the wire passing through its center in the same way, and a similar nailing to the stick taking place. We have now a paper globe, with its own axis, which will be its companion for the whole term of its existence.

The paper globe is next placed on its axis in a frame, of which one side is a semicircular piece of metal—the horizon of a globe cut in half would show its form. A tub of white composition—a compound of whiting, glue, and oil—is on the bench. The workman dips his hand into this “gruel thick and slab,” and rapidly applies it to the paper sphere with tolerable evenness; but as it revolves, the semicircle of metal clears off the superfluous portions. The ball of paper is now a ball of plaster externally. Time again enters largely into the manufacture. The first coating must thoroughly dry before the next is applied, and so again till the process has been repeated four or five times. Thus, when we visit a globe-workshop, we are at first surprised at the number of white balls, from three inches in diameter to three feet, which occupy a large space. They are all steadily advancing toward completion; and as they advance to the dignity of perfect spheres, increased pains is taken in the application of the plaster. At last they are polished. Their surface is as fine and hard as ivory. But beautiful as they

are, they may, like many other beautiful things, want a due equipoise. They must be perfectly balanced. They must move upon their poles with the utmost exactness. A few shot, let in here and there, correct all irregularities. And now the paper and plaster sphere is to be endued with intelligence. The sphere is marked with lines of direction for the purpose of covering it with engraved slips. We have now a globe with a plain map. An artist colors it by hand.

We have given these examples of several modes of production, in which knowledge and skill have diminished labor, for the purpose of showing that not only machinery and scientific applications are constantly tending to the same end, but that the mere practice of the mechanical arts necessarily leads to labor-saving inventions. Every one of us who thinks at all is constantly endeavoring to diminish his individual labor by the use of some little contrivance which experience has suggested. Men who carry water in buckets, in places where water is scarce, put a circular piece of wood to float on the water, which prevents it spilling, and consequently lessens the labor. A boy who makes paper bags in a grocer's shop so arranges them that he pastes the edges of twenty at a time, to diminish the labor. The porters of Amsterdam, who draw heavy goods upon a sort of sledge, every now and then throw a greased rope under the sledge, to diminish its friction, and, therefore, to lessen the labor of carrying it. Other porters, in the same city, have a little barrel containing water, attached to each side of the sledge, out of which the water slowly drips like the water upon a stone-cutter's saw, to diminish the friction.

In the domestic arrangements of a well-regulated household, whether of a poor man or of a rich man, one of the chief cares is to save labor. Every contrivance to save

labor that ingenuity can suggest, is eagerly adopted when a country becomes highly civilized. In the middle ages, when such contrivances were little known, and materials as well as time were constantly wasted in every direction, a great baron was surrounded with a hundred menial servants; but he had certainly less real and useful labor performed for him than a merchant of the present day obtains from three servants. Are there fewer servants now employed than in those times of barbarous state? Certainly not. The persons of moderate means among us can get a great deal done for them in the way of domestic service, at a small expense, because servants are assisted by manifold contrivances which do much of the work for them. The contrivances render the article of service cheaper, and, therefore, there are more servants. The work being done by fewer servants, in consequence of the contrivances, the servants themselves are better paid than if there was no cost saved by the contrivance.

The common jack by which meat is roasted, is described by Mr. Babbage as "a contrivance to enable the cook in a few minutes to exert a force (in winding up the jack) which the machine retails out during the succeeding hour in turn in the loaded spit, thus enabling her to turn her undivided attention on her other duties." We have seen, years ago, a man employed to turn a spit with a handle; dogs have been used to run in a wheel for the same purpose, and hence a particular breed so used are called "turnspits." When some ingenious servant-girl discovered that if she put a skewer through the meat and hung it before the fire by a skein of worsted, it would turn with very little attention, she made an approach to the principle of the roasting-jack. All these contrivances diminish labor, and insure regularity of movement—and, therefore, they are valuable contrivances.

A bell which is pulled in one room and rings in another, and which, therefore, establishes a ready communication between the most distant parts of a house, is a contrivance to save labor. In a large family the total want of bells would add a fourth at least to the labor of servants. Where three servants are kept now, four servants would be required to be kept then. Would the destruction of all the bells, therefore, add one fourth to the demand for servants? Certainly not. The funds employed in paying for service would not be increased a single farthing; and, therefore, by the destruction of bells, some work would be left undone to make up for the additional labor required through the want of this useful contrivance; or all the servants would be more hardly worked.

In some parts of India, the natives have a very rude contrivance to mark the progress of time. A thin metal cup, with a small hole in its bottom, is put to float in a vessel of water; and as the water rises through the hole the cup sinks in a given time—in twenty-four minutes. A servant is set to watch the sinking of the cup, and when this happens he strikes upon a bell. Half a century ago, almost every cottage in England had its hour-glass—an imperfect instrument for registering the progress of time, because it only indicated its course between hour and hour; and an instrument which required a very watchful attention, and some labor, to be of any use at all. The universal use of watches or clocks, in India, would wholly displace the labor of the servants who note the progress of time by the filling of the cup; and the same cause has displaced the equally unprofitable labor employed in turning the hour-glasses, and watching its movement. Every house in the United States has now a clock or watch of some sort; and every house in India would have the same, if the natives were more enlightened, and were not engaged in so many modes of un-

profitable labor to keep them poor. His profitable labor has given the American mechanic the means of getting a watch. Machinery, used in every possible way, has made this watch cheap. The labor formerly employed in turning the hour-glass, or in running to look at the church clock, is transferred to the making of watches. The user of the watch obtains an accurate register of time, which teaches him to know the value of that most precious possession, and to economize it; and the producers of the watch have abundant employment in the universal demand for this valuable machine.

A watch or clock is an instrument for assisting an operation of the mind. Without some instrument for registering time, the mind could very imperfectly attain the end which the watch attains, not requiring any mental labor. The observation of the progress of time, by the situation of the sun in the day, or of particular stars at night, is a labor requiring great attention, and various sorts of accurate knowledge. It is therefore never attempted, except when men have no machines for registering time. In the same manner the labors of the mind have been saved in a thousand ways, by other contrivances of science.

The foot-rule of the carpenter not only gives him the standard of a foot measure, which he could not exactly ascertain by any experience, or any mental process, but it is also a scale of the proportions of an inch, or several inches, to a foot, and of the parts of an inch to an inch. What a quantity of calculations, and of dividing by compasses, does this little instrument save the carpenter, besides insuring a much greater degree of accuracy in all his operations! The common rules of arithmetic, which almost every boy now learns, are parts of a great invention for saving mental labor. The higher branches of mathematics, of which science arithmetic is a portion, are also inventions for saving labor, and

for doing what could never be done without these inventions. There are instruments, and very curious ones, for lessening the labor of all arithmetical calculations; and tables, that is, the results of certain calculations, which are of practical use, are constructed for the same purpose. When we buy a joint of meat, we often see the butcher turn to a little book, before he tells us how much a certain number of pounds and ounces amounts to, at a certain price per pound. This book is his "Ready Reckoner," and a very useful book it is to him; for it enables him to dispatch his customers in half the time that he would otherwise require, and thus to save himself a great deal of labor, and a great deal of inaccuracy. The inventions for saving mental labor, in calculations of arithmetic, have been carried so far, that Mr. Babbage had almost perfected a calculating machine, which not only did its work of calculation without the possibility of error, but absolutely was to arrange printing types or figures, in a frame, so that no error could be produced in copying the calculations before they are printed. We mention this curious machine, to show how far science may go in diminishing mental labor, and insuring accuracy. The want of government aid prevented its completion.

To all who read this book it is no difficulty to count a hundred; and most know the relation which a hundred bears to a thousand, and a thousand bears to a million. Most are able, also, to read off those numbers, or parts of those numbers, when they see them marked down in figures. There are many uncivilized people in the world who can not count twenty. They have no idea whatever of numbers, beyond perhaps as far as the number of their fingers, or their fingers and their toes. How have we obtained this great superiority over these poor savages? Because science has been at work, for many centuries,

to diminish the amount of our mental labor, by teaching us the easiest modes of calculation. And how did we learn these modes? We learned them from our school-masters.

If any follow up the false reasoning which has led some to think that whatever diminishes labor diminishes the number of laborers, they might conclude that, as there is less mental work to be done, because science has diminished the labor of that work, there would, therefore, be fewer mental workmen. Thank God, the greater facilities that have been given to the cultivation of the mind, the greater is the number of those who exert themselves in that cultivation. The effects of saving unprofitable labor are the same in all cases. The use of machinery in aid of *bodily* labor has set that bodily labor to a thousand new employments; and has raised the character of the employments, by transferring the lowest of the drudgery to wheels and pistons. The use of science in the assistance of *mental* labor has conducted that labor to infinitely more numerous fields of exertion; and has elevated all intellectual pursuits, by making their commoner processes the play of childhood, instead of the toil of manhood.

We can not doubt that any invention which gives assistance to the thinking powers of mankind, and, therefore, by dispensing with much mental drudgery, leads the mind forward to nobler exertions, is a benefit to all. It is not more than four hundred years ago, that the use of Arabic numerals, or figures, began to be generally known in this country. The first date in those numerals said to exist in England, is upon a brass plate in Ware church, 1454. The same date in Roman numerals, which were in use before the Arabic ones, would be expressed by eight letters MCCCCLIV. The introduction of figures, therefore, was an immense saving of time in the commonest operations of arith-

metic. How puzzled we should be, and what a quantity of labor we should lose, if we were compelled to reckon earnings and marketings by the long mode of notation, instead of the short one! This book is easily read, because it is written in words composed of twenty-four letters. In China, where there are no letters in use, every word in the language is expressed by a different character. Few people in China write or read; and those who do, acquire very little knowledge, except the mere knowledge of writing and reading. All the time of their learned men is occupied in acquiring the means of knowledge, and not the knowledge itself; and the bulk of the people get very little knowledge at all. It would be just the same thing if there were no machines or engines for diminishing manual labor. Those who had any property would occupy all their time, and the time of their immediate dependents, in raising food and making clothes for themselves, and the rest of the people would go without any food or clothes at all; or rather, which comes to the same thing, there would be *no* "rest of the people;" the lord and his vassals would have all the produce; there would be half a million of people in the United States instead of twenty-three millions.

When a boy has got hold of what we call the rudiments of learning, he has possessed himself of the most useful tools and machines which exist in the world. He has obtained the means of doing that with extreme ease, which, without these tools, is done only with extreme labor. He has earned the time which, if rightly employed, will elevate his mind, and therefore improve his condition. Just so is it with all tools and machines for diminishing bodily exertion. They give us the means of doing that with comparative ease, which, without them, can only be done with extreme drudgery. They set at liberty a great quantity of mere animal power, which, having then leisure to unite with

mental power, produces ingenious and skillful workmen in every trade. But they do more than this. They diminish human suffering—they improve the health; they increase the term of life; they render all occupations less painful and laborious; and, by doing all this, they elevate man in the scale of existence.

A late Pasha of Egypt, in one of those fits of caprice which it is the nature of tyrants to exhibit, ordered, a few years ago, that the male population of a district should be set to clear out one of the ancient canals which was then filled up with mud. The people had no tools, and the Pasha gave them no tools; but the work was required to be done. So to work the poor wretches went, to the number of fifty thousand. They had to plunge up to their necks in the filthiest slime, and to bale it out with their hands, and their hands alone. They were fed, it is true, during the operation; but their food was of a quality proportioned to the little *profitable* labor which they performed. They were fed on horse-beans and water. In the course of one year, more than thirty thousand of these unhappy people perished. If the tyrant, instead of giving labor to fifty thousand people, had possessed the means of setting up steam-engines to pump out the water, and mud-machines to scoop out the mud—or, if he had provided the pump, which is called Archimedes' screw, and was invented by that philosopher for the very purpose of draining land in Egypt—or if the people had even had scoops and shovels, instead of being degraded like beasts, to the employment of their unassisted hands—the work might have been done at a fiftieth of the cost, even of the miserable pittance of horse-beans and water; and the money that was saved by the tools and machines, might have gone to furnish *profitable* labor to the thousands who perished amid the misery and degradation of their *unprofitable* labor.

Some may say that this is a case which does not apply to us; because we are free men, and can not be compelled to perish, up to our necks in mud, upon a pittance of horse-beans, doled out by a tyrant. Exactly so. But what has made us free? Knowledge. Knowledge—which, in raising the moral and intellectual character of every American,



MUD-MACHINE.

has raised up barriers to oppression which no power can ever break down. Knowledge—which has set ingenious men thinking in every way how to increase the profitable labor of the nation, and therefore to increase the comforts of every man in the nation.

The people of England and the United States have gone on increasing very rapidly during the last fifty years; and the average length of life has also gone on increasing in the same remarkable manner. Men who have attended to sub-

jects of political economy have always been desirous to procure accurate returns of the average duration of life at particular places, and they could pretty well estimate the condition of the people from these returns. Savages, it is well known, are not long livers; that is, although there may be a few old people, the majority of savages die very young. Why is this? Many of the savage nations that we know have much finer climates than our own; but then, on the other hand, they sustain privations which the poorest man among us never feels. Their supply of food is uncertain, they want clothing, they are badly sheltered from the weather, or not sheltered at all, they undergo very severe labor when they are laboring. From all these causes savages die young. Is it not reasonable, therefore, to infer that if in any particular country the average duration of life goes on increasing; that is, if fewer people, in a given number and a given time, die now than formerly, the condition of that people is improved; that they have more of the necessities and comforts of life, and labor less severely to procure them? Now let us see how the people of England stand in this respect. The average mortality in a year about a century ago was reckoned to be one in thirty, and now it is one in forty-six.* This result is, doubtless, produced in some degree by improvement in the science of medicine, and particularly by the use of vaccination. But

* The average mortality of the people of the United States, as calculated from the returns of the last census (1850) is as follows: "In the New England States, the average mortality in a year is one in sixty-four; in the Middle States, with Ohio, one to seventy-two; in the Southern planting and slave States, one to seventy-three; in the North-western States, one to seventy-three. Total average for the whole United States, one to seventy-three. This is substantially the ratio stated by Noah Webster for the interior towns in 1805. "The annual deaths," he observes, "amount only to one in seventy or seventy-five of the population."

making every allowance for these benefits, the fact furnishes the most undeniable truth, that the people of England are much better fed, clothed, and lodged than they were a century ago, and that the labor which they perform is far less severe.

The effect of continued violent bodily exertion upon the duration of life might be illustrated by many instances; we shall mention one. The late Mr. Edgeworth, in his *Memoirs*, repeatedly speaks of a boatman whom he knew at Lyons, as an old man. "His hair," says Mr. Edgeworth, "was gray, his face wrinkled, his back bent, and all his limbs and features had the appearance of those of a man of sixty; yet his real age was but twenty-seven years. He told me that he was the oldest boatman on the Rhone, that his younger brothers had been worn out before they were twenty-five years old; such were the effects of the hardships to which they were subject from the nature of their employment." That employment was, by intense bodily exertion, and with the daily chance of being upset, to pull a boat across one of the most rapid rivers in the world—

"The swift and arrowy Rhone,"

as one of our poets calls it. How much happier would these boatmen have been during their lives, and how much longer would they have lived, could their labor have been relieved by some mechanical contrivance! and without doubt, the same contrivance would have doubled the number of boatmen, by causing the passage to be more used. As it was, they were few in number, they lived only a few years, and the only gratification of those few years was an inordinate stimulus of brandy. This is the case in all trades where immense efforts of bodily power are required. The exertion itself wears out the people, and the dram which gives

a momentary impulse to the exertion, wears them out still more. The coal-heavers of London, healthy as they look, are but a short-lived people. The heavy loads which they carry, and the quantity of liquor which they drink, both together make sad havoc with them.

Violent bodily labor, in which the muscular power of the body is unequally applied, generally produces some peculiar disease. Nearly all the pressmen who were accustomed to print newspapers of a large size, by hand, were ruptured. The printing-machine now does the same description of work.

What is the effect upon the condition of pressmen generally by the introduction of the printing-machine to do the heaviest labor of printing? That the trade of a pressman is daily becoming one more of *skill* than of *drudgery*. At the same time that the printing-machine was invented, one of the principles of that machine, that of inking the types with a roller instead of two large cushions, called balls, was introduced into hand-printing. The pressmen were delighted with this improvement. "Ay," said they, "this saves our labor; we are relieved from the hard work of distributing the ink upon the balls." What the roller did for the individual pressman, the machine, which can only be beneficially applied to rapid and to very heavy printing, does for the great body of pressmen. It removes a certain portion of the drudgery, which degraded the occupation, and rendered it painful and injurious to health. We have seen two pressmen working a daily paper against time: it was always necessary, before the introduction of the machines, to put an immense quantity of bodily energy into the labor of working a newspaper, that it might be published at the proper hour. Time, in this case, was driving the pressman as fast as the rapid stream drove the boatmen of the Rhone; and the speed with which they worked was killing them as quickly.

It has oftentimes been asserted that those exposed to severe labor in the open atmosphere, were the least subject to sickness. This has recently been proven a fallacy by Mr. Finlaison, Actuary of the National Debt Office in London. Of persons engaged at heavy labor in out-door exposure, the per centage of sickness in the year is 28.05. Of those engaged at heavy labor in-doors, such as blacksmiths, etc., the per centage of sickness is 26.54—not much difference to be sure—but of those engaged at light occupations in-doors and out, the per centage of sickness is only 20.80—21.58. For every three cases of sickness in those engaged at light labor, there are four cases among those whose lot is heavy labor. The mortality, however, is greatest among those engaged in light toil, and in-door labor is less favorable to longevity than laboring in the open atmosphere. It is established clearly, however, Mr. Finlaison says, “that the quantum of sickness annually falling to the lot of man, is in direct proportion to demands on his muscular power.” How true this makes the assertion, “Every inventor who abridges labor and relieves man from the drudgery of severe toil, is a benefactor of his race.” Man is relieved from drudgery by the iron sinews of the machine, and his own are left to move more lightly and free in pursuing avocations demanding less physical but more mental and noble exertion.



fr Bacon

CHAPTER XXII.

INFLUENCES OF KNOWLEDGE IN THE DIRECTION OF LABOR AND CAPITAL.—MANUFACTURE OF SODA-ASH.—CONNECTION OF SOAP AND CIVILIZATION.—ASTRONOMY.—CHRONOMETER.—MARINER'S COMPASS.—SCIENTIFIC TRAVELERS.—NEW MATERIALS OF MANUFACTURES.—INDIA RUBBER.—GUTTA-PERCHA.—PALM-OIL.—GEOLOGY.—INVENTIONS THAT DIMINISH RISK.—SCIENCE RAISING UP NEW EMPLOYMENTS.—ELECTRICITY.—GALVANISM.—SUN-LIGHT.—MENTAL LABORERS.—ENLIGHTENED PUBLIC SENTIMENT.

LORD BACON, the great master of practical wisdom, has said that "the effort to extend the dominion of man over nature is the most healthy and most noble of all ambitions." "The empire of man," he adds, "over material things has for its only foundation the sciences and the arts."*

* We have taken this sentence as a motto which may point to the general scope of this volume.

deal of the knowledge which constitutes this dominion has been the property of society, handed down from the earliest ages. No one can tell, for instance, how the art of leavening bread was introduced among mankind; and yet this process, now so familiar to all, contributes as much, if not more, than any other art to the wholesome and agreeable preparation of our food. Leavening bread is a branch of chemistry, and, like that process, many other processes of chemistry have been the common property of civilized man from time immemorial. Within a few centuries, however, science has applied its discoveries to the perfection of the arts; and in proportion as capital has been at hand to encourage science, has the progress of the application been certain and rapid. The old Alchemists, or hunters after the philosopher's stone, sought to create capital by their discoveries. They could not make gold, but they discovered certain principles which have done as much for the creation of utility in a few hundred years as the rude manual labor of all mankind during the same period. Let it not be supposed that we wish to depreciate manual labor. We only wish to show that labor is incomparably more prolific when directed by science. Mahomet Bey, the ruler of Tunis, was dethroned by his subjects. He had the reputation of possessing the philosopher's stone, or the art of turning common metals into gold. The Dey of Algiers restored him to his throne upon condition that the secret should be communicated to him. Mahomet, with great pomp and solemnity, sent the Dey of Algiers a plow. This was so far well. He intimated that to compel production by labor is to make a nation rich. But had he been able to transmit some of the science which now controls and guides the operations of the plow—the chemical knowledge which teaches the proper application of manures to soils—the rotation of crops introduced by

the turnip-husbandry, which renders it unnecessary that the ground should ever be idle—he would have gone further toward communicating the real philosopher's stone.

The indirect influence, too, of a general advance in knowledge upon the particular advance of any branch of labor, is undeniable; for the inquiring spirit of an age spreads itself on all sides, and improvement is carried into the most obscure recesses, the darkest chinks and corners of a nation. It has been wisely and beautifully said, "We can not reasonably expect that a piece of woollen cloth will be brought to perfection in a nation which is ignorant of astronomy, or where ethics are neglected,"* The positive influence of science in the direction of labor is chiefly exhibited in the operations of mechanics and chemistry applied to the arts, in the shape of machines for saving materials and labor, and of processes for attaining the same economy.

We have described the effects of some of these manifold inventions in the improvement of the condition both of producers and consumers. But there are many particulars in which knowledge has labored, and is still laboring, for the advance of the physical and moral condition of us all, which may have escaped attention; because these labors operate remotely and indirectly, though not without the highest ultimate certainty and efficiency, in aiding the great business of production. These are the influences of science upon labor, not so direct as the mechanical skill which has contrived the steam-engine, or so indirect as the operation of ethics upon the manufacture of a piece of woollen cloth; but which confer a certain and in some instances enormous benefit upon production, by the operation of causes which, upon a superficial view, appear to be only matters of laborious but unprofitable speculation. If

* Hume's Essays.

we succeed in pointing out the extent and importance of those aids which production derives from the labors of men who have not been ordinarily classed among "working men," but who have been truly the hardest and most profitable workers which society has ever possessed, we shall show what an intimate union subsists among those classes of society who appear the most separated, and that these men really labor with all others most effectually in the advancement of the great interests of mankind.

"No limit," says Professor Forbes, "can be set to the importance, even in a purely productive and material point of view, of mere thought. The labor of the savant, or speculative thinker, is as much a part of production, in the very narrowest sense, as that of the inventor of a practical art; many such inventions having been the direct consequences of theoretic discoveries, and every extension of the knowledge of the powers of nature being fruitful of applications to the purposes of outward life."

A most striking illustration of this is shown in the history and results of the discovery of the process for manufacturing soda from common salt. This process was first devised by Le Blanc, a French chemist, about the close of the last century. It remained for a long time unnoticed, or was regarded as simply a curious chemical result, interesting merely in a scientific point of view. It was not, indeed, until 1820 that any successful trial was made with it in England.

But the reader will ask, what was used before this process was adopted? It is well known that the two great chemical productions, soap and glass, which at present employ and keep in circulation an enormous capital, depend on the use of soda as an alkaline principle. Previous to 1820, nearly all the soda of commerce was obtained from the ashes of sea-weeds, which sold in the market under the

name of Spanish barilla and kelp, the latter being produced chiefly on the coast of Scotland. Only a small quantity of the weight of these substances, however, was an alkali. The barilla contained eighteen per cent., and was sold for about fifty dollars per ton; and the kelp only five or six per cent., and sold for about twenty dollars per ton. It is clear that the soap or glass-maker in buying these substances would, in the one case, purchase ninety-five parts of worthless material, and in the other, eighty-two parts—we say worthless, because of no service in the fabrication of soap or glass. It would seem, therefore, that the introduction of a strong and cheap alkali would have been hailed by the soap and glass-makers as one of the greatest advantages. But in the commencement of the undertaking to manufacture the soda from salt it was quite the contrary, and the chemists and soda manufacturers found it extremely difficult to dissipate the prejudice in favor of the kelp and barilla. When, however, the soda prepared from salt (the common soda-ash of commerce) was once introduced, it so reduced the cost of making soap, that the operation of alkalizing the fats which had before cost forty dollars per ton was effected more speedily at ten dollars per ton. The consequence was that the whole soap trade required soda-ash, and the demand for soap, on account of its reduced price, was so great that for some time the soda-ash was sent to the soap-makers of Liverpool hot from the furnaces, in iron carts, the manufacturers of soda being wholly unable to answer the calls made upon them. Similar effects were produced in the manufacture of glass. The business of manufacturing soda-ash increased so fast that, in 1837, seventeen years after the establishment of the first manufactory in England, the quantity produced in a single year was 72,000 tons, and at the present time it is more than doubled. The same year, also, Liverpool alone exported

more soda than the whole of Great Britain had done previous to the introduction of soda-ash.

The manufacturers of kelp and barilla were in a great measure deprived of employment by this discovery, and, doubtless, complained bitterly. But the compensation rendered by the employment of a greater number of laborers in manufacturing and exporting soda-ash, and in producing the increased amounts of glass and soap required, was not all. To manufacture soda from salt requires the employment of sulphuric acid and common salt. To produce sulphuric acid, sulphur and nitrate of soda are necessary. The new and increased demand for these articles gave an impetus to labor all over the world. In 1824, the amount of sulphur used in England but little exceeded 5,000 tons per annum. In 1847, the amount consumed was 24,220 tons. The glass-maker, to supply the increased demand for his products, has been obliged to buy more sand and lead; and the soap-maker has required a greater supply of fats. As the amount of fat produced by animals can not be suddenly increased at will, human ingenuity has resorted to other expedients to meet the necessities of the case, and fats are now obtained in great quantities from the vegetable kingdom, especially from the palm-trees of the west coast of Africa. In 1824, England consumed only 8,900 casks of palm-oil; in 1853, the amount imported into Great Britain was upward of 70,000 casks, and a nearly equal amount must have been imported to France, the United States, and other countries. In addition to the increased demand for labor, consequent upon the consumption of this large amount of palm-oil, its importation from the coast of Africa has produced most beneficial effects. In the districts from whence the great supplies of palm-oil are obtained, the slave-trade was formerly carried on with great vigor; but now, in these same districts, the natives are profitably em-

ployed, and the slave-trade, which can never stand in the presence of commerce, has been in consequence effectually crushed. The alkali manufacturer, therefore, is thus indirectly a minister of civilization, and a creator of independence to nations, for he makes regulated industry essential to these nations, consequently rendering local labor valuable.

A late writer has thus calculated the value of the discovery of Le Blanc to the English nation, from 1820 to 1827, so far only as respects the manufacture of soap: "One ton of soda-ash now goes as far as eight tons of kelp and three tons of barilla; therefore, taking the charge now made for a ton of kelp and a ton of barilla, compared with that of soda-ash, a saving has been effected equivalent to \$7,000,000; and taking the prices of these articles previous to the introduction of soda-ash, the saving to the country has been upward of \$20,000,000."

Thus we see how great a benefit to the world has resulted directly and indirectly, from the labors of a comparatively obscure chemist, working in his laboratory—labors, which at the time they were performed, were no doubt considered by the great majority of those cognizant of them as of no practical value.

According to Liebig, the quantity of soap consumed by a nation would be no inaccurate measure whereby to estimate its wealth and civilization. Of two countries, therefore, with an equal amount of population, the wealthiest and most highly civilized will consume the greatest quantity of soap; which consumption does not subserve sensual gratification, nor depend upon fashion, but upon the feeling of the beauty, comfort, and welfare attendant upon cleanliness; and a regard to this feeling is consistent with wealth and civilization. The rich in the middle ages concealed a want of cleanliness in their cloths and persons under a profusion of costly scents and essences, while they were more luxu-

rious in eating and drinking, in apparel and horses. With us a want of cleanliness is equivalent to insupportable misery and misfortune. Thanks to the labors of science, the price of soap at the present time is such as to debar not even the poorest from its unrestricted use.

When Hume thought that a nation would be behind in the manufacture of cloth that had not studied astronomy, he perhaps did not mean to go the length of saying, that the study of astronomy has a real influence in making cloth cheaper, in lessening the cost of production, and in therefore increasing the number of consumers. But look at the direct influence of astronomy upon navigation. A seaman, by the guidance of principles laid down by the great minds that have directed their mathematical powers to the study of astronomy—such minds as those of Newton and La Place—measures the moon's apparent distance from a particular star. He turns to a page in the "Nautical Almanac," and by a calculation directed principally by this table, can determine whereabouts he is upon the broad ocean, although he may not have seen land for three months. Sir John Herschel, has given in his "Discourse on the Study of Natural Philosophy," an instance of the accuracy of such lunar observations, in an account of a voyage of eight thousand miles, by Captain Basil Hall, who, without a single landmark during eighty-nine days, ran his ship into the harbor of Rio as accurately, and with as little deviation, as a coachman drives his stage into an inn-yard. But navigation not only depends upon lunar distances, but upon an instrument which shall keep perfect time under every change of temperature produced by variety of climate. That instrument is a chronometer. Every one who possesses a watch, however good, must have experienced the effects of heat or cold upon its accuracy, in making it go faster or slower—perhaps a minute in a week. Now if there were not an instrument

that would measure time so exactly that between London and New York not a minute, or large fraction of a minute, would be lost or gained, the voyage would be one of difficulty and uncertainty. A Yorkshire joiner, John Harrison,



NEW YORK AND LIVERPOOL STEAMER.

at the beginning of the last century, found out the principle of the chronometer, which consists in the union in the balance-spring of two metals, one which contracts under increased temperature, and one which expands; and on the contrary under diminished temperature. Harrison worked for fifty years at his discovery; and he obtained a parliamentary reward of £20,000.

The English chronometers are set by what is called Greenwich time. The beautiful instruments that are constantly at work, and the laborious calculations which are daily proceeding, at the Observatory, are essentially necessary for the maintenance of a commerce that embraces the whole habitable globe.

But what has this, it may be said, to do with the price of clothing? Exactly this: part of the price arises from the



cost of transport. If there were no "lunar distances" in the "Nautical Almanac," or chronometers, the voyage from New York to Liverpool might require three months instead of a fortnight. But go a step farther back in the influence of science upon navigation. There was a time when ships could hardly venture to leave the shore. In the days of our Anglo-Saxon ancestors, a merchant who went three times over the sea with his own craft, was entitled to rank as a thegn, or nobleman. Long after this early period of England's navigation, voyages across the Atlantic could never have been attempted. That was before the invention of the mariner's compass; but even after that invention, when astronomy was not scientifically applied to navigation, long voyages were considered in the highest degree dangerous. The crews both of Vasco de Gama, who discovered the passage to India, and of Columbus, principally consisted of criminals, who were pardoned on condition of undertaking a service of such peril. The discovery of magnetism, however, changed the whole principle of navigation, and raised seamanship to a science. If the mariner's compass had not been invented, America could never have been discovered; and if America, and the passage to India by the Cape of Good Hope, had never been discovered, cotton would never have been brought to England; and if cotton had never been brought to England, the English people would have been as badly off for clothing as the people of the middle ages, and the millions of working men and women, manufacturers of cotton, and dealers in cotton goods, would have been without employment.

Astronomy, therefore, and navigation, both sciences the results of long ages of patient inquiry, have opened a communication between the uttermost ends of the earth; and therefore have had a slow, but certain effect upon the production of wealth, and the consequent diffusion of all the

necessaries, comforts, and conveniences of civilized life. The connection between manufactures and science, practical commerce and abstract speculation, is so intimate that it might be traced in a thousand striking instances. Columbus, the discoverer of America, satisfied his mind that the earth was round; and when he had got this abstract idea firmly in his head, he next became satisfied that he should find a new continent by sailing in a westerly course. The abstract notion which filled the mind of Columbus that the earth was a sphere, ultimately changed the condition of every living being in the Old World that then existed, or has since existed. In the year 1488, the first geographical maps and charts that had been seen in England were brought hither by the brother of Christopher Columbus. If these maps had not been constructed by the unceasing labors of men in their closets, Columbus would never have thought of discovering "the unknown land" which occupied his whole soul. If the scanty knowledge of geography which existed in the time of Columbus had not received immense additions from the subsequent labors of other students of geography, the United States would not have thousands of merchant ships ready to trade wherever men have any thing to exchange—that is, wherever men are enabled to give of their abundance for our abundance, each being immensely benefitted by the intercourse. A map now appears a common thing, but it is impossible to overrate the extent of the accumulated observations that go to make up a map. An almanac seems a common thing, but it is impossible to overrate the prodigious accumulations of science that go to make up an almanac. With these accumulations, it is now no very difficult matter to construct a map or an almanac. But if society could be deprived of the accumulations, and we had to re-create and remodel every thing for the formation of our map and our almanac,

it would perhaps require many centuries before these accumulations could be built up again ; and all the arts of life would go backward, for want of the guidance of the principles of which the map and the almanac are the interpreters for popular use. But the maps and charts of former days are not now deemed sufficient for the present necessities of commerce, and new examinations, and more accurate explorations are constantly projected and carried out by governments, or private individuals. Several years ago, Lieut. Maury commenced to gather from old sea journals such information as they might be found to contain relative to the winds and currents of the sea, and to embody the information so obtained on a series of charts, in such a manner as to show by diagrams the prevailing direction of the winds and currents for every month and in every part of the ocean. From the information gained by the careful examination and comparison of more than a thousand log-books, he has been enabled to prepare numerous charts showing various sailing routes and the direction of the winds and currents by the use of which the duration of voyages has been considerably shortened. A large amount of benefit has thus accrued to commerce, and with reference to the voyage between Europe and America alone, it is stated that ships now go from New York to England and back in less time than, when Charleston was the half-way house, they could get from Charleston to London.

There never was a time when man had so complete possession of the planet which he inhabits as the present. Much of the globe has yet to be explored ; but how much is familiar to us that was comparatively unknown even at the beginning of the present century ! How thoroughly during that period have we acclimated many of the plants of distant lands, which are now the common beauties of our gardens and green-houses ! There are thousands of

timber-trees coming to rapid maturity in our parks and pleasure-grounds which, thirty years ago, grew only in the solitudes of California and Australia. What impelled Ledyard, Sir John Franklin, Humboldt, and hundreds of other travelers of a similar character, to encounter the perils of travel in desert regions, but the abstract love of science, which made them naturalists in their closets before they were explorers and discoverers? We are familiar with the name of Linnæus, and the Linnæan system of botany; and some may think that this great naturalist was not doing much for knowledge when he classified and arranged what we call the vegetable kingdom. When very young, Linnæus underwent many hardships in traveling through Lapland, in search of plants. So far, some may say, he was well employed. He was equally well employed when he made such an inventory, to use a familiar term, of all the known plants of his time, as would enable succeeding naturalists to know a distinct species from an accidental variety, and to give a precision to all future botanical investigation. Other naturalists have produced other systems, which may be more simple and convenient; but the impulse which Linnæus gave to botanical discovery, and thence to the increase of the vegetable wealth of Europe, can never be too highly appreciated.

In every branch of natural history, the study of the science, in its manifold forms of classification, is constantly leading to the most valuable discoveries connected with our means of existence. Some twenty years ago all the timber of the Hartz Forest in Germany was destroyed by a species of beetle, which, gnawing completely round the bark, prevented the sap from rising. This destructive animal made its appearance in England; and science very soon discovered the cause of the evil, and provided for its removal. If there had been no knowledge of natural

history here, not a tree would have been left in the woods: and what then would have been the cost of timber. The naturalist is now carrying his investigations, with the aid of the microscope, into the lowest departments of animal life. He finds the causes of blight and mildew, and knows the species of the minutest insect that mars the hopes of the farmer and the gardener. The chemist steps in; and the ravager is destroyed or rendered less noxious.

It is to the scientific travelers that we owe the successive introduction of new materials of manufactures. Of the enormous extent in which such new materials affect production, we may form some adequate notion from the mention of three—India rubber, Gutta-percha, and Palm-oil.

In 1853 we imported 2,000,000 lbs. of caoutchouc or India rubber. The gum of a Brazilian tree, discovered by some scientific Frenchman in 1735, had been employed for nearly a century for no higher purpose than rubbing out pencil-marks. Recently the mode of applying this substance for the production of water-proof garments was discovered. In 1830 we only imported a small quantity. Since then caoutchouc has become one of our great materials of manufacture, applied, not only to clothing, but to useful articles of every description. Its great property of elasticity has rendered it available in numberless instances beyond those of making cloth water-proof and air-tight. When we discovered how to make India rubber soluble by spirit, we obtained our water-proof clothes, our air-cushions, and water-beds. When machinery drew out the lump of gum into the finest threads, and connected them with cotton, flax, silk, or worsted, in a braiding-machine, we became provided with every species of elastic web that can render dress at once tight and easy. But chemistry has carried the use of India rubber further than

the spirit which dissolves it, or the machinery which splits it into minute threads. Chemistry has combined it with sulphur, and thus added in a remarkable degree to its strength and its elasticity. It has made it independent of temperature. It has doubled its utility. "Vulcanized India rubber" is one of the most valuable of recent inventions.

It is a striking characteristic of our age, and particularly as compared with the period when India rubber was first sent to Europe, that the application of gutta percha to the arts immediately followed the discovery of the substance. In 1842, Dr. Montgomerie was observing a wood-cutter at Singapore at his ordinary labor. Looking at the man's ax he saw that the handle was not of wood, but of some material that he had not previously known. The woodman told Dr. Montgomerie that, hard as the handle was, it became quite soft in boiling water, and could be molded into any form, when it would again become hard. It was a gum from a tree growing in various islands of the Eastern archipelago, called *pertsha*. Specimens were immediately sent to the Society of Arts at London; and the inquiring surgeon to the Presidency at Singapore received the Society's gold-medal. In 1842-3, Mr. Lobb, visiting these islands to collect botanical specimens, also discovered the same tree, and the gum which issues from it.

Since then the wonderful utility of this new material has been established in very various applications. But the gum would have remained comparatively useless but for the inventive spirit which has subdued every difficulty of a new manufacture. The substance is now applied to the humblest as well as the highest purposes. It is a clothes' line defying the weather; it is a buffer for a rail-way carriage. It is a stopping for a hollow tooth; it is a sheathing for the wire that conveys the electric spark across the Channel. It

is a cricket-ball; it is a life-boat in the Arctic seas. It is a noiseless curtain-ring; it is a sanitary water-pipe. It resists the action of many chemical substances, and is thus largely employed for vessels in bleaching and dyeing factories; it is capable of being molded into the most beautiful forms, and thus becomes one of the most efficient materials for multiplying works of ornamental art. The collection of gutta-percha has given a new stimulus to the feeble industry of the inhabitants of Java and Sumatra, and Borneo, and a new direction to the commerce of Singapore. It has brought the people of the Indian archipelago into more direct contact with European civilization.



APPEARANCE OF THE GUTTA-PERCHA OF COMMERCE.

What the use of gutta-percha is doing for the Malays, the use of palm-oil is doing for the Africans. Much of this oil is used for making candles. What has created this enormous manufacture of one of the most improved articles of domestic utility? Knowledge. The palm-oil candles have been brought to their present perfection by chemical and mechanical appliances, working with the most complete division of labor, carried through by the nicest economy resulting from great administrative skill. The superior quality of the products of the oil-candle factories is the result of chemistry. A French chemist discovered that fats, such as oil, were composed of three inflammable acids—two of which, called stearic and margaric, are solid; and one

called oleic, fluid. Another substance called glycerine is also present. The oil is now freed from the oleic acid and the glycerine, which interfere with its power of producing light, and the two solid acids are crystalized. What are called stearine and composite candles are thus produced, at a cost which is really less than that of the old tallow-candles, when we consider that they burn longer and with greater brilliancy, besides being freed from a disagreeable smell and from a tendency to gutter. Candles from animal fat have also been greatly improved by chemical appliances in the preparation of the tallow.

Science, we thus see, connects distant regions, and renders the world one great commercial market. Science is, therefore, a chief instrument in the production of commercial wealth. But we have a world beneath our feet which science has only just now begun to explore. We want fuel and metallic ore to be raised from the bowels of the earth; and, till within a very few years, we used to dig at random when we desired to dig a mine, or confided the outlay of thousands of pounds to be used in digging, to some quack whose pretensions to knowledge were even more deceptive than a reliance upon chance. The science of geology, almost within the last quarter of a century, has been able, upon certain principles, to determine where coal especially can be found, by knowing in what strata of earth coal is formed; and thus the expense of digging through earth to search for coal, when science would at once pronounce that no coal was there, has been altogether withdrawn from the amount of capital to be expended in the raising of coal. That this saving has not been small, we may know from the fact, that eighty thousand pounds were expended fruitlessly in digging for coal in England, not many years ago, which expense geology would have instantly prevented; and have thus accumulated capital, and given a profitable stimulus to

labor, by saving their waste. But geological science has not only prevented the expensive search for coal where it does not exist, but has shown that it does exist where, a few years ago, it was held impossible to find it. The practical men of England, as they are called, maintained that coal could not be found beneath the magnesian limestone. A scientific geologist, Dr. William Smith, held a contrary opinion; and the result of his abstract conviction is, that the great English Hetton collieries have been called into action, which supply a vast amount of coal to the London market, found beneath this dreaded barrier of magnesian limestone. Geology—however scanty its facts at present are, compared with what they will be when miners have been accustomed to look at their operations from the scientific point of view—geology can tell pretty accurately in which strata of the earth the various metals are likely to be found; and knowing, to some extent, the strata of different countries, can judge of the probability of finding the precious metals as well as the more common. Sir Roderick Murchison, in 1844, expressed his belief, in a public address, that gold existed in the great Eastern Chain of Australia. In 1849, an iron-worker in Australia, reading this opinion, searched for gold, and found it. The discovery was neglected, till an enterprising man came from California, and completed the realization of the scientific prediction. The importance of gold, merely as a material of manufacture, may be estimated from the fact that in Birmingham, England, alone, a thousand ounces of fine gold are worked up every week; and that ten thousand ounces are annually used in the porcelain works of Staffordshire.

Whatever diminishes the risk to life or health, in any mechanical operation, or any exertion of bodily labor, lessens the cost of production, by diminishing the premium which is charged by the producers to cover the risk. The

safety-lamp of Sir Humphrey Davy, by diminishing the waste of human life employed in raising coals, diminished the price of coals. The contrivance is a very simple one, though it was no doubt the result of anxious and patient thought. It is a common oil-lamp, in which the flame is surrounded with a fine wire-gauze. The flame can not pass through the gauze; and thus if the destructive gas of a coal-mine enters the gauze and ignites, the flame can not pass again out of the gauze and ignite the surrounding gas. Sometimes the inner flame burns with a terrible blue light. It is the symptom of danger. If the lamp were an open flame the fire-damp would shake the pit with one dreadful explosion. The safety-lamp yields a feeble light; and thus, unfortunately, the miner sometimes exposes the flame, and perishes. The magnetic mask, which prevents iron-filings escaping down the throats of grinders and polishers, and thus prevents the consumption of the lungs, to which these trades are peculiarly obnoxious, would diminish the price of steel goods, if the workmen did not prefer receiving the premium in the shape of higher wages, to the health and long life which they would get, without the premium, by the use of the mask. This is not wisdom on the part of the workmen. But whether they are wise or not, the natural and inevitable influence of the discovery, sooner or later—to lessen the cost of production in that trade, by lessening the risk of the laborers—must be established. The lightning conductor of Franklin, which is used very generally, and almost universally in this country, diminishes the risk of property, in the same way that the safety-lamp diminishes the risk of life; and, by this diminution, the rate of insurance is lessened, and the cost of production, therefore, lessened.

We have given many examples of labor-saving processes produced by science. We may regard it as a compensating

principle that science is constantly raising up new employments. In 1798, Galvani, an Italian physician, accidentally discovered that the muscles of a dead frog were convulsed by the body coming in contact with two metals. Soon after, Volta, another Italian physician, produced electric



BENJAMIN FRANKLIN.

currents by a combination of metals in what was called the voltaic-pile. Who could have imagined that the patient working-out of the scientific principle that was evolved in the movement of Galvani's dead frog, should have raised up new branches of human industry, of the most extensive and varied utility? Galvanic batteries used to be considered among the toys of science. They now send an instantaneous message from New York to New Orleans; and fill our houses with the most beautiful articles of metallic manufacture—electro-plate. About sixteen years ago it was discovered that a piece of metal might receive a fine permanent coating of another metal by the agency of galvanism. The

discovery created a strong interest in men of science, and many small experiments were tried to fix a coating of copper to some other metal. Manufacturing enterprise saw the value of the discovery, which has been simply described in a popular work :

“Diluted sulphuric acid is poured into a porous vessel; this is placed in a larger vessel containing a solution of sulphate of copper; a piece of zinc is placed in the former, and a piece of silver or of copper in the latter, and both pieces are connected by a wire. Then does the wondrous agent, electricity, begin its work; a current sets in from the zinc to the acid, thence through the porous vessel to the sulphate, thence to the silver or copper, and thence to the conducting wire back again to the zinc; and so on in an endless circuit. But electricity never makes such a circuit without disturbing the chemical relations of the bodies through which it passes; the zinc, the silver or copper, the sulphuric acid, the oxygen, and the hydrogen, all are so far affected that the zinc becomes eaten away, while a beautiful deposit of metallic copper, derived from the decomposition of the sulphate appears on the surface of the silver or copper. Copper is not the only metal which can be thus precipitated; gold, silver, platinum, and other metals may be similarly treated.”

When experiment had proved that every imaginable form of cheap metal could be coated with silver or gold, by the agency of electro-chemistry, an immediate demand was created for designers, modelers, and molders. Vases of the most beautiful forms were to be produced in metal which should have the properties of solid silver without its costliness. The common metal vase is dipped into a tank containing a solution of silver. It is placed in connection with the wires of the galvanic battery. Atom after atom of the silver in solution clings to the vase, which soon

comes out perfectly silvered. The burnisher completes its beauty. It is the same with a solution of gold. The pride of riches may boast the value of a solid plate, which tempts thieves to "break in and steal." The nobler gratification of taste may secure the beauty without the expense or risk of loss.

But the great principle thus brought into practical use is carried further in the realms of art. It becomes a copying process. It can multiply copies of the most minute engraving without in the slightest degree deteriorating the beauty of the engraver's work. The copy is as good as the original.

The same principle of depositing one metal upon another in minute atoms has produced galvanized tinned-iron—iron which will not rust upon exposure to weather, and thus applicable to many purposes of building—and iron which can be applied to many objects of utility with greater advantage than tin-plate.

There are few persons now without their daguerreotype portraits of some member of the family. This is a portrait copied from the human face by a sunbeam. The name daguerreotype is derived from the Frenchman Daguerre, the discoverer. We notice this branch of recent invention merely to point out how science and art call forth mechanical labor. When every house has its little portrait, there will naturally be a great demand for frames. The manufacture of daguerreotype-frames in the United States, has furnished a new field of employment.

Every scientific discovery, such as photography, is a step in advance of preceding discovery. If Newton had not discovered the fundamental properties of light, in the seventeenth century, we should, in all likelihood, have had no photography in the nineteenth. Abstract science is the parent of practical art.

"Arago affirms that men will learn to speak of the age of Papin or of Watt as they now speak of the ages of kings and warriors. The monarch may distinguish his rule by advancing his people in civilization; the warrior may strike off bonds from the limbs of slaves, or scatter in the fields of conquest the seeds of literature and art; but the man who gives to the world a new power, and teaches his brethren how to wield it, has a royalty of his own, and deserves that 'Hero Worship' which enthusiasts offer at the shrine of greatness.

"Newton, by developing the laws of gravitation; Franklin, by drawing lightning from the clouds; and James Watt, by his discoveries of the relations of heat and steam, stand toward the world in the attitude of creators. They have been the instruments through which truths have been brought into the world—and these truths have exalted man's intelligence and increased his power.

"Newton's great truth has had its application in every branch of mechanical science. The falling apple took root in the soil. The clock which beats the passing moments, the machine employed to drive the pile, and the science of projectile forces—now so important to Europe and the world—are some of the fruits gathered from the tree which sprang from that falling apple. Newton gave us, in the truth which he discovered, a balance in which to weigh the planets of our system, and the sun around which they revolve. Franklin, with his wonderful kite, realized the poetic fable of Prometheus—he stole the fire from heaven. But greater than Prometheus, he subdued the spirit of the storm, and taught mankind to protect themselves from the torrents of his wrath. The slender thread of Franklin's kite, along which the lightning traveled, was the line from which has been derived the electrical wire, which now conveys men's thoughts and wishes over land and under ocean."

It has been said by one of our eminent writers, that the "man who will go into a cotton-mill—who will observe the parts of the machinery, and the various processes of the fabric, till he reaches the hydraulic press, with which it is made into a bale, and the canal or rail-road by which it is sent to market, may find every branch of trade, and every



SIR ISAAC NEWTON.

department of science, literally crossed, intertwined, interwoven with every other, like the woof and warp of the article manufactured."* This crossing and intertwining of the abstract and practical sciences, the mechanical skill and the manual labor, which are so striking in the manufacture of a piece of calico, prevail throughout every department of industry in a highly civilized community. Every one who labors at all profitably, labors for the production of utility, and sets in motion the labor of others. Look at the

* "Everett's Working Man's Party." Printed in the American Library of Useful knowledge, 1831.

labor of the medical profession. In the fourteenth century, John de Gaddesden treated a son of Edward II. for the small-pox by wrapping him up in scarlet cloth, and hanging scarlet curtains round his bed; and as a remedy for epilepsy, the same physician carried his patients to church to hear mass. The medical art was so little understood in those days that the professors of medicine had made no impression upon the understanding of the people; and they, consequently, trusted not to medicine, but to vain charms, which superstitions the ignorance of the practitioners themselves kept alive. The surgical practitioners of Europe, at the beginning of the sixteenth century, put their unhappy patients to the most dreadful torture by their mode of treating wounds and broken limbs. When they amputated a leg or an arm they applied the actual cautery, or red-hot iron, to stop the effusion of blood. Ambrose Paré, one of the most eminent of the French surgeons of that period, who accompanied the army to the siege of Turin, in 1536, thus describes the mode in which he found his surgical brethren dealing with gunshot wounds:

"I was then very raw and inexperienced, having never seen the treatment of gunshot wounds. It is true that I had read in the Treatise of Jean de Vigo on wounds in general, that those inflicted by fire-arms partake of a poisonous nature on account of the powder, and that they should be treated with hot oil of elder, mixed with a little theriacum. Seeing, therefore, that such an application must needs put the patient to extreme pain, to assure myself before I should make use of this boiling oil, I desired to see how it was employed by the other surgeons. I found their method was to apply it at the first dressing, as hot as possible, within the wounds, with tents and setons; and this I made bold to do likewise. At length my oil failed me, and I was fain to substitute a digestive, made of the yolk of eggs, rose-oil,

and turpentine. At night I could not rest in my bed in peace, fearing that I should find the wounded, in whose cases I had been compelled to abstain from using this cautery, dead of poison: this apprehension made me rise very early in the morning to visit them; but beyond all my hopes, I found those to whom I had applied the digestive, suffering little pain, and their wounds free from inflammation; and they had been refreshed by sleep in the night. On the contrary, I found those to whom the aforesaid oil had been applied, feverish, in great pain, and with swelling and inflammation round their wounds. I resolved, therefore, that I would never burn unfortunate sufferers from gunshot in that cruel manner again." Francis I., king of France, having a persuasion that, because the Jews were the most skillful physicians of that day, the virtue was in the Jew, and not in the science which he professed, sent to Charles V. of Spain for a Jewish physician; but finding that the man who arrived had been converted to Christianity, he refused to employ him, thinking the virtue of healing had therefore departed from him. A statute of Henry VIII. says, "For as much as the science and cunning of physie and surgery is daily within this realm exercised by a great multitude of ignorant persons, of whom the greater part have no insight in the same, nor in any other kind of learning: some, also, con no letters on the book, so far forth, that common artificers, as smiths, and weavers, and women, boldly and accustomedly, take upon them great cures, in which they partly use sorcery and witchcraft, partly apply such medicines to the disease as be very noxious, and nothing meet, to the high displeasure of God, great infamy to the faculty, and the grievous damage and destruction of diverse of the king's people." When such ignorance prevailed, diseases of the slightest kind must have been very often fatal; and the power of all men to labor profitably must have been greatly

diminished by the ravages of sickness. These ravages are now checked by medical science and medical labor.

But even within our own times how greatly has general ignorance retarded the exertions of medical science to diminish suffering and to reduce the amount of mortality! The prejudices against vaccination have rendered it extremely difficult to eradicate small-pox, however certain the result of the great discovery of Jenner. According to the recent laws of several States, all children hereafter *must* be vaccinated at the public expense. Such a law would have been very difficult of execution fifty years ago. The people had then seen the scarred faces from small-pox disappearing among them. They had learned that, at the beginning of this century, vaccination, or the puncture of the skin with matter originally obtained from the cow, was rooting out the small-pox, which used to destroy, not more than a hundred years ago, thirty-six thousand persons annually, in Great Britain. And yet many ignorant persons will not avail themselves of laws, under which their children *might* be vaccinated at the public cost. The undoubted testimony of the whole medical profession proves that vaccination in almost all cases prevents small-pox, and in all cases mitigates its evil. But that testimony further proves that if vaccination were universal, small-pox would wholly disappear; and that is the reason why vaccination is now compulsory.

But we may regard the influences of knowledge upon the direction and aid of profitable labor, even from a higher point of view. The sciences and arts can not be carried forward except in a country where the laws of God are respected, where justice is upheld, where intellect generally is cultivated, and taste is diffused. The religious and moral teacher, therefore, who lifts the mind to a contemplation of the duties of man, as they are founded upon a belief in the

Providence of an all-wise and all-powerful Creator, is a profitable laborer. The instructor of the young, who dedicates his time to advancing the formation of the right principles, and the acquirement of sound knowledge, by his pupils, is a profitable laborer. The writer who applies his understanding to the discovery and dissemination of moral and political truth, is a profitable laborer. The interpreter and administrator of the laws, who upholds the reign of order and security, defending the innocent, punishing the guilty, and vindicating the rights of all from outrage and oppression, is a profitable laborer. These laborers, it may be said, are still direct producers of utility, but that those who address themselves to the imagination—the poets, the novelists, the painters, and the musicians—in every polished society, are unprofitable laborers. One word is sufficient for an answer. These men advance the general intellect of a country, and they therefore indirectly advance the production of articles of necessity. We have already shown how the study of the higher mathematics, upon which astronomy is founded, as an influence upon the production of a piece of woollen cloth; and we beg our readers to bear this connection in mind when they hear it said, as they sometimes may, that an abstract student, or an elegant writer, is not a producer—is, in fact, an idler. The most illustrious writers of every country, the great poets,

“High actions and high passions best describing,”

have, next to the inspirations of religion, lifted mankind, more than any other class of intellectual workmen, to their noblest pursuits of knowledge and virtue. Even those who especially devote themselves to give pleasure and amusement, call into action some of the highest and purest sources of enjoyment. They lead the mind to seek its recreations in more ennobling pursuits than those of sensuality; t

arts connect themselves by a thousand associations with all that is beautiful in the natural world; they are as useful for the promotion of pure and innocent delight as the flowers that gladden us by their beauty and fragrance by the side of the corn that nourishes us. An entire community of poets and artists would be as unprofitable as if an entire country were dedicated to the cultivation of violets and roses; but the poets and the artists may, as the roses and the violets, furnish the graces and ornaments of life, without injury, and indeed with positive benefit, to the classes who more especially dedicate themselves to what is somewhat exclusively called the productions of utility. The right direction of the talents which are dedicated to art and literature is all that is required from those who address themselves to these pursuits. He, therefore, who beguiles a vacant hour of its tediousness, by some effort of intellect which captivates the imagination without poisoning the morals—and he who by the exercise of his art produces forms of beauty which awaken in the mind that principle of taste which, more than any other faculty, requires cultivation—have each bestowed benefits upon the world which may be accurately enough measured even by the severe limitations of political economy; they are profitable laborers and benefactors of their species.

The positive influence of the labors of the poet and the artist upon the advance of other labor might be easily shown. In their productions, especially, supply goes before demand, and creates demand. It has been calculated by an American writer, that the number of workmen who have been set in action—paper-makers, printers, binders—by the writings of Sir Walter Scott alone, in all countries, would, if gathered together, form a community that would fill a large town. The Potteries of Staffordshire, England, could not have existed unless Mr. Wedgwood had introduced into

the manufacture of china the forms of Grecian art, bequeathed to us by the taste of two thousand years ago, and thus created a demand which has furnished profitable labor to thousands. There are 21,000 pianoes made in the United States each year, affording employment to upward of 3,500 workmen. What has given this branch of industry its chief impulse? The divine art of Handel, Mozart, Beethoven, Weber, Rossini, Mendelsohn. If these great composers, and many others, had not raised music into something higher and more capable of producing enjoyment than the rude melodies of uncivilized tribes, there would have been no trade in piano-fortes.

We have entered into these details, principally to show that there are other and higher producers in society than the mere manual laborers. It was an ignorant fashion among the mental laborers of other days to despise the class of the physical laborers. They have learned to know their value; and there should be a reciprocal knowledge. Both classes are working-classes. No one can say that the mental laborers are not workers. They are, we may truly affirm, taken as a class, the hardest workers in the community. No one ever reached eminence in these pursuits without unwearied industry: the most eminent have been universally despisers of ease and sloth, and have felt their highest pleasures in the absorbing devotion of their entire minds to the duties of their high calling. They have wooed Knowledge as a mistress that could not be won without years of unwearied assiduity. The most eminent, too, have been practical men, despising no inquiry, however trifling it might appear to common eyes, and shrinking from no occupation, however tedious, as long as it was connected with their higher duties.

There is no higher duty than that of endeavoring so to lead public opinion, as that the general mind of the com-

munity shall be directed to noble and unselfish ends. The poet, the historian, the essayist, the novelist, have the responsibility of keeping alive the love of freedom, the hatred of oppression, the cultivation of Christian charity. There never was a truly great nation that had a low literature. It is the glory of the Anglo-Saxon race that its literature is among its best possessions; and that the general scope and tendency of that literature are calculated to raise and cherish an enlightened public sentiment. Whatever be the amount of national wealth—however various the comforts and luxuries which private riches may command—it is quite certain that without that courage and intelligence which make a people free and keep them so, the public and private accumulations are comparatively worthless. There is a beautiful Eastern story which may better illustrate this position than any lengthened argument.*

* It is related that a man of the pilgrims slept a long sleep, and then awoke, and saw no trace of the other pilgrims. So he arose and walked on; but he wandered from the way, and he proceeded until he saw a tent, and an old woman at its door, and he found by her a dog asleep. He approached the tent, saluted the old woman, and begged of her some food; whereupon she said to him, Go to yon valley, and catch as many serpents as will suffice thee, that I may broil some of them for thee. The man replied, I dare not catch serpents, and I never ate them. The old woman therefore said, I will go with thee, and catch some of them, and fear thou not. Then she went with him, and the dog followed her, and she caught as many of the serpents as would suffice, and proceeded to broil some of them. The pilgrim could not refrain from eating; for he feared hunger and emaciation: so he ate of those serpents. And

* Note to Mr. Lane's admirable translation of the "Thousand and One Nights," original edition, vol. ii. p. 635.

after this, being thirsty, he demanded of the old woman some water to drink; and she said to him, Go to the spring, and drink of it. Accordingly he went to the spring; but he found its water bitter; yet he could not refrain from drinking of it, notwithstanding its exceeding bitterness, on account of the violence of his thirst. He therefore drank, and then returned to the old woman, and said to her, I wonder at thee, O thou old woman, and at thy residing in this place, and thy feeding thyself with this food, and thy drinking of this water. How then, said the old woman, is your country? He answered her, Verily, in our country are spacious and ample houses, and ripe and delicious fruits, and abundant sweet waters, and excellent viands, and fat meats, and numerous sheep, and every thing good, and blessings of which the like exist not save in the Paradise that God (whose name be exalted!) hath described to his just servants. All this, replied the old woman, I have heard; but tell me, have you any Sultan who ruleth over you, and oppresseth in his rule while ye are under his authority; and who, if any one of you committeth an offense, taketh his wealth, and destroyeth him, and who, if he desire, turneth you out from your houses, and eradicateth you utterly? The man answered her, That doth sometimes happen. And the old woman rejoined, If so, by Allah, that dainty food and elegant life, and those delightful comforts, with oppression and tyranny, are penetrating poison; and our food, with safety, is a salutary antidote."



MONUMENT OF LORD BACON.

CHAPTER XXIII.

INVENTION OF PRINTING.—EFFECTS OF THAT ART.—A DAILY NEWSPAPER.—PROVINCIAL NEWSPAPERS.—NEWS-WRITING OF FORMER PERIODS.—CHANGES IN THE CHARACTER OF NEWSPAPERS.—STEAM CONVEYANCE.—ELECTRIC TELEGRAPH.—ORGANIZATION OF A NEWSPAPER-OFFICE.—THE PRINTING-MACHINE.—THE PAPER-MACHINE.—BOOKBINDING.

THE art of printing offers one of the readiest and most forcible illustrations of the advantages that have been bestowed upon the world by scientific discovery and by mechanical power. Although there is, happily, little occasion

now to combat any wide-spread hostility to machinery, the argument for its use derived from printing may be very briefly stated.

It is nearly four hundred years since the art of printing books was invented. Before that time all books were written by the hand. There were many persons employed to copy out books, but they were very dear, although the copiers had small wages. A Bible was sold for thirty pounds in the money of that day, which was equal to a great deal more of our money. Of course, very few people had Bibles or any other books. A mode was invented of imitating the written books by cutting the letters on wood, and taking off copies from the wooden blocks by rubbing the sheet on the back. Soon after, the idea was carried further by casting metal types or letters, which could be arranged in words, and sentences, and pages, and volumes; and then a machine, called a printing-press, upon the principle of a screw, was made to stamp impressions of these types so arranged. There was an end, then, at once to the trade of the pen-and-ink copiers; because the copiers in types, who could press off several hundred books while the writers were producing one, drove them out of the market. A single printer could do the work of at least two hundred writers. At first sight this seems a hardship, for a hundred and ninety-nine people might have been, and probably were, thrown out of their accustomed employment. But what was the consequence in a year or two? Where one written book was sold, a thousand printed books were required. The old books were multiplied in all countries, and new books were composed by men of talent and learning, because they could then find numerous readers. The printing-press did the work more neatly and more correctly than the writer, and it did it infinitely cheaper. What then? The writers of books had to turn their hands to some other trade,

it is true; but type-founders, paper-makers, printers, and bookbinders, were set to work, by the new art or machine, to at least a hundred times greater number of persons than the old way of making books employed.

But there is a far more important mode of viewing this matter than any consideration resulting out of the increased employment that the art of printing unquestionably has created. If printing, which is a cheap and a rapid process, could by possibility be superseded by writing, which is an expensive and a slow operation, no book, no newspaper, could be produced for the use of the people. Knowledge, upon which every hope of bettering their condition must ultimately rest, would again become the property of a very few; and mankind would lose the greater part of that power which constitutes the essential difference between civilization and barbarism. The art of printing has gone on more and more adapting itself to the increase of our population, during the three centuries and a half in which it has been exercised in this country. Herein consists, perhaps, one of the mightiest differences between our condition and that of every generation which has preceded us. Through that art, no idea can now perish. Through that art, knowledge is fast becoming the common possession of all. Through that art, what the people have gained in the past is secured for the future. It has established the empire of public opinion.

There is possibly no more striking example of the manifold combinations of mental labor, of scientific power, of mechanical invention, and of the use of rapid means of communication, than the forces now called into action for the issue of a daily newspaper. Nor is there any production of literary industry which more pointedly illustrates the distinctive qualities of printing as compared with writing—the rapidity, the cheapness, and the general diffusion. Let us endeavor to supply a rapid sketch of the wonderful organi-

zation that is required to produce this great necessary of modern society.

The essential characteristic of a newspaper is news. It may be philosophical, or critical, or imaginative; it may pour forth treasures of learning or eloquence, to live but a few hours and then be too readily forgotten; but no amount of ability will give it currency if it be deficient in news. It is the imperative demand for news, embracing every movement of human life in every class and every country, that sets in action the wondrous organization that produces a daily newspaper. Its ministers of communication are almost ubiquitous. They are in the police-office, watching the effrontery of the detected felon; they are on the battle-fields of Mexico and the Crimea, to stir our hearts "as with a trumpet," and fill our eyes with tears as they tell us

"How sleep the brave, who sink to rest,
By all their country's wishes blest."

They are at the city feast, where all is blandishment and turtle; they are at the coroner's inquest upon a street-starved pauper. They furnish news to all the world; and they receive news from all the world.

The editors of a leading daily paper have the not very easy task of glancing over the multitude of local papers from different sections of the United States. These are, in ordinary cases, the vehicles from which they obtain their intelligence. If any local matter of general interest is to be specially attended to, their own correspondent, or their own reporter, furnishes the details. Some unexpected event puts the electric telegraph in motion, to tell the world of New York, on Saturday morning, what occurred at Boston or New Orleans on Friday night; and the Boston or New Orleans merchant reads on Saturday morning in a

newspaper printed in his own city, some notice of an arrival in New York during the hours when he was sleeping. Even the state of the weather at different parts of the country is thus daily transmitted. But the editors of leading papers have to look out for news at a greater distance than is comprised in our boundaries. They have to search the papers of every land and every people—whether written in English, French, German, Italian, Greek, or Turkish. For the New York daily papers the electric telegraph is “throwing its shadows” before the authentic heralds of “coming events.” For them is the steamer bringing the special correspondence from the gold-diggings in California, and from the courts of Europe. For them do the people’s representatives make long speeches to empty benches, secure that there is a medium of communication for unnumbered eyes, although the ears be shut of those who listen not to the voice of the charmers. For them do public men go into obscure places, and, addressing an enthusiastic dinner-table, or a solemn convention, speak to the world. For them does every discoverer of a private grievance claim public redress. For them is produced, in letters “to the editor,” that great chaotic accumulation of fact and theory, of wisdom and folly, of calculation and impulse, whose atoms finally resolve themselves into a solid mass called public opinion.

The mental labors attendant upon the country newspapers are more narrowed. But they are, nevertheless, very important; and the extension of their functions by the enormous extension of the facilities for obtaining intelligence is equally striking. The old county papers, circulating steadily through the rural districts, and duly chronicling deaths and marriages, markets and misdemeanors, have been stirred into activity by newspapers issuing from great commercial and manufacturing centers, which have arisen with the immense development of our industry. The local changes in

these vehicles of intelligence are strikingly connected with the other great social changes which have been noticed in this volume. It is satisfactory to know that the country press is no imperfect representative of an age of progress.

The history of news-writing and news-publishing is a mirror of many of the changes in social necessities and conveniences. In 1625, Ben Jonson's play of "The Staple



Ben. Jonson.

of News" exhibited a countrywoman going to an office of news, and saying to the manager, who sits in state with his registers and examiners—

"I would have, sir,
A groatsworth of any news, I care not what,
To carry down this Saturday to our vicar."

This was written news. In London, before a newspaper existed, there were private gazetteers, who made a living by picking up scraps of intelligence in taverns and barbers'

shops. This class of persons continued even when there were newspapers; for the news-letter, as it was called, is thus described in the first number of the "Evening Post," issued in 1709:—"There must be £3 or £4 per annum paid by those gentlemen that are out of town for written news, which is so far generally from having any probability or matter of fact in it, that it is frequently stuffed up with a 'We hear,' or 'An eminent Jew merchant has received a letter.'" The same "Evening Post" adds—"We read more of our own affairs in the Dutch papers than in any of our own." Sir Roger L'Estrange, who published "The Intelligencer," with privilege, in 1663, says that he shall publish once a week, "to be published every Thursday, and finished upon the Tuesday night, leaving Wednesday entire for the printing it off." The first advertisement in an English paper appeared in 1649.

At the beginning of the present century the public used to look with wonder upon their "folio of four pages," and contrast it with the scanty chronicles of more ancient days. We of the present time, in the same way, contrast our newspapers with the meager records of the beginning of the century. The essential difference has been produced by steam navigation, by rail-ways, by the extension of the post, dependent upon both applications of steam and by the electric telegraph. The same scientific forces and administrative organization that bring the written news from every region of the earth, re-convey the printed news to every region. With this certain and rapid intercourse, it is not likely that the least enterprising newspaper editor would have to repeat the doubt of L'Estrange, who says, "Once a week may do the business; yet if I shall find, when my hand is in, and after the planting and securing my correspondents, that the matter will fairly furnish more, I shall keep myself free to double at pleasure."

It is the external communication so wonderful in our own times, we repeat, which has chiefly changed the character of our newspapers. When we read in a London daily paper the one line—"The Overland Mail—by electric telegraph"—we have two facts of the highest significance. "The Overland Mail" would appear, of itself, a marvel great enough for one age. The Overland Mail has brought London within a month, and New York within six weeks of Bombay. It has joined India most effectually to England for all commercial and state purposes. It gives England the news of India, by the aid of the electric telegraph, in as little time as news was ordinarily received from Vienna at the beginning of the eighteenth century. The steamer and the electric telegraph made the blood of England beat quicker in every heart, when the newspapers recorded, on the 13th of November, the most sanguinary battle of modern times, fought in the Crimea only a week previous. When Marlborough was setting out for his campaign of 1709, and so many political, if not patriotic, hopes, were fixed upon the probable issue, "The Tatler," then a newspaper, had the following paragraph; "We learn from Brussels, by letters dated the 20th, that on the 14th, in the evening, the Duke of Marlborough and Prince Eugene arrived at Courtray, with a design to proceed the day following to Lisle, in the neighborhood of which city the confederate army was to arrive the same day." The account of the movement of the great allied generals was transmitted from Brussels six days after the movement had taken place, Courtray being only distant forty-six miles; and the important news from Brussels, of the 20th May, was published in London on the 28th, London being distant some two hundred and fifty miles. The distance from Balaklava to London is about three thousand miles.

The function of a great newspaper, in connection

the positions of armies and the events of siege and battle, is as different from the function of the journalist of fifty years ago, as the rapid firing of the modern soldier with his Minié rifle contrasts with the slow evolutions of the old hand-gunner. In the war of the Allies with Russia the presence of the newspaper reporter gives a new feature, strikingly characteristic of our times and our progress. It was necessary to have the earliest and the most detailed accounts of this eventful contest; for the people of Great Britain, one and all, understood that they are deeply interested in its issue, and that, if their country failed to assert its superiority, the material prosperity of that country could be of no long duration. Wisely, therefore, did the London daily papers each send their active, fearless, and eloquent correspondents, to endure some of the hardships of the march and the bivouac—to observe the battle-field, not secure from its dangers—to write of victories, surrounded by the dead and dying—to be the historians of a day, and thus to furnish the best materials for all future historians. The life of a reporter, although a life of constant labor, is generally accompanied by much ease and comfort. The senate does not acknowledge his presence; but it provides the "stranger" with the best seat. He takes his place at the public dinner as an honored guest—one whose absence would be more regretted than that of the city's mayor or the representative in congress. But in a campaign, like that of the Valley of Mexico, or in the Crimea, where his duties are new, he must fight his way through every difficulty. His function is recognized in an age when it would be useless to suppress intelligence, even if it were possible. He finds a ready mess in every tent where a scanty meal is set out; he stands by the side of the commander, and gazes with him upon "the currents of the heady fight." How he wears after two months of unusual service we have some

slight notion, when we read, in a letter to "*The Times*" of November 30, 1854, that the writer had seen an officer who had lately parted from the special correspondent. "The chances of war had deprived him of nearly all his garments; and when last seen he was walking about in a rifleman's jacket, much too small for his portly person; and his nether garments had been converted into breeches by a constant scrambling among rocks and briers." Let us not forget our obligations to the men who, in peril and suffering, have made heroic action more familiar to us; and have contributed no mean part in giving a moral impulse to our country, as essential to future safety and honor as the material wealth which has made us a people among the foremost of the earth.

What the carrier-pigeon was in the conveyance of intelligence in the middle ages, and even within a few years, the electric telegraph is in the present day. The carrier-pigeon went out from a besieged castle, to ask for succor, in eastern countries, five centuries ago. The electric telegraph, land and submarine, brings the tidings of slaughter and sickness from Sebastopol, and England and France send instant reinforcements. The carrier-pigeon, in the last century, was dispatched by the merchants of the English factory, from Scanderoon to Aleppo, to announce the arrival of the company's ships. The electric telegraph communicates to New Orleans the arrival of an English steamer at New York or Halifax. Within the last ten years, one of the annual expenses of a London newspaper was \$9,000 for pigeon expresses. The pigeons have now lost their employment. The carrier-pigeon traveled sixty miles an hour. The time which it takes to transmit a message by electric telegraph is inappreciable. The newspapers of the United States employ the electric telegraph far more extensively than the *English* papers. The distance between

Quebec and New Orleans, a distance of three thousand miles, is overleaped by the electric telegraph. Two lines, each two thousand miles long, connect New York with New Orleans; and over this space messages are transmitted, and answers received, in three hours. When we read long paragraphs in the morning papers, received by electric telegraph, after midnight, from Halifax, we wonder how this is accomplished. Eighteen words, which are equal to about two newspaper lines, are transmitted every minute; and the full message from Halifax, containing the steamer's news, carefully transcribed, is in the hands of the newspaper editor in half an hour. Furthermore, we may now almost predict with certainty, that within the next ten years, the people of the United States will read in the morning papers the events which took place the day before in England, and all important points on the continent of Europe; and that the daily sale of stocks upon the Exchange of London or the *Bourse* of Paris, will be reported side by side with those of Wall-street in New York.

To carry out all this scientific conquest of time and space, by the most perfect mental and mechanical arrangements in the newspaper office itself, appears, at first sight, almost as great a wonder as the rapid communication. Nothing but the most perfect organization of the division of labor could accomplish the feat.

There is, after midnight, in the office of a morning paper, a constant necessity for adapting the labor of every quarter of an hour to the requirements of the instant time. Much of the newspaper matter may have been in type in the evening; some portion may be quite ready for printing off. But new necessities may derange much of this preparation. Suppose a steamer arrives, or a session of Congress is unexpectedly prolonged into the night. Column after column of information is poured in. Smaller matter must

give way to greater. The intelligence that will keep is put aside for the information that is pressing. The session is prolonged till one or two o'clock, and the paper is approaching its completion. But an electric telegraph communication has arrived—perhaps an important express. Away goes more news. Advertisements, law reports, police reports, correspondence—all retire into obscurity for one day. There is plenty of manipulating power in the great body of compositors to effect these changes. But not in any department is there any apparent bustle. Nor is there any neglect in the labors that wait upon the work of the compositors. One word is not put for another. The readers are as vigilant to correct every error—to have no false spelling and no inaccurate punctuation—as if they were bestowing their vigilance upon a book to be published next season. The reporters are as careful to make no slips which would indicate a want of knowledge, as if they were calmly writing in their libraries after breakfast. The one-presiding mind of the editor is watchful over all. At four or five o'clock the morning paper goes to press.

But there are many hundred copies to be dispatched by the morning mails and expresses. The merchant, banker, lawyer, would go unwillingly to his morning labor, if he had not had one passing glance at the discussion in the House, the state of the money-market, the last foreign intelligence. Late as the paper may have been in its mental completion, the distant country, and the city itself, will not be kept without that illumination which has become almost as necessary as sunlight. Machinery has been created by the demand, to carry the demand further than the warmest imagination could have anticipated. In 1814, Kœnig, a German, erected the first printing-machine at the London "*Times*" office, and produced eighteen hundred impressions

an hour on one side. The machine superseded the duplicates of the type which were once necessary, painfully and laboriously to keep up a small supply, worked by men, with relays, at the rate of five hundred an hour.



HOE'S CYLINDER PRINTING-PRESS.

Koenig's machine, which was a very complicated instrument, was supplanted at the "*Times*" office by Applegath's and Cowper's machine, which printed four thousand sheets an hour on one side. But that has been surpassed by Hoe's Rotary Printing-Press, which prints twenty thousand copies an hour on one side. The separate columns of the type are placed on a large type-drum, and firmly secured. The

drum is surrounded by eight impressing cylinders; the ink is applied to the surface of the type by rollers which work between these cylinders; and the sheets are laid on upon eight tables, which, by a most ingenious mechanism, carry each sheet to a point where its position is suddenly changed, and it is impressed between the type and the cylinder; the paper being then suspended by tapes, from which it is released as it passes forward, to be laid upon the heap which will be scattered, in a few hours, to every portion of the country.

The printing-machines, which have been in full operation for little more than twenty years, have called into action an amount of employment which was almost wholly unknown when knowledge was for the few. Paper-makers, type-founders, wood-engravers, bookbinders, booksellers, have been raised up by this extension of the art of printing, in numbers which far exceed those of any former period.

But the printing-machine would have worked feebly and imperfectly without the paper-machine. That most complete invention has not only cheapened paper itself, but it has cheapened the subsequent operations of printing, in a remarkable degree. It has enabled one revolution of the cylinder of the printing machine to produce four sheets instead of one, or a surface of print equal to four sheets. When paper was altogether made by hand, the usual paper for books was called demy; and a sheet of demy produced sixteen octavo pages of a book. The paper could not have been economically made larger by hand. A sheet of paper equal to four sheets of demy is now worked at the newspaper machine; and sixty-four pages of an octavo book might be so worked, if it were needful for cheapening production. Double demy is constantly worked for books. Thus, one economical arrangement of science produces another contrivance; and machines in one direction combine with

machines having a different object, to produce legitimate cheapness, injurious to no one, but beneficial to all.

Let us attempt to convey a notion of the beautiful operations of the paper-machine.

In the whole range of machinery, there is perhaps, no series of contrivances which so forcibly address themselves to the senses. There is nothing mysterious in the operation; we at once see the beginning and the end of it. At one extremity of the long range of wheels and cylinders we are shown a stream of pulp, not thicker than milk and water, flowing over a moving plane; at the other extremity the same stream has not only become perfectly solid, but is wound upon a reel in the form of hard and smooth paper. This is, at first sight, as miraculous as any of the fancies of an Arabian tale. *Abdûl*'s wonderful lamp, by which a palace was built in a night, did not in truth produce more extraordinary effects than science has done with the paper-machine.

At one extremity of the machine is a chest, full of stuff or pulp. We mount the steps by its side, and see a long beam rolling incessantly round this capacious vessel, and thus keeping the fibers of rags, which look like snow flakes, perpetually moving, and consequently equally suspended, in the water. At the bottom of the chest, and above the vat, there is a cock through which we observe a continuous stream of pulp flowing into the vat; which is always, therefore, filled to a certain height. From the upper to the lower part of this vat a portion of the pulp flows upon a narrow wire frame, which constantly jumps up and down with a clacking noise. Having passed through the sifter, the pulp flows still onward to a ledge, over which it falls in a regular stream, like a sheet of water over a smooth dam. Here we see it caught upon a plane, which presents an uninterrupted surface of five or six feet, upon which the pulp

seems evenly spread, as a napkin upon a table. A more accurate inspection shows us that this plane is constantly moving onward with a gradual pace; that it has also a shaking motion from side to side; and that it is perforated all over with little holes—in fact, that it is an endless web of the finest wire. If we touch the pulp at the end of the plane, upon which it first descends, we find it fluid; if we draw the finger over its edge at the other end, we perceive that it is still soft—not so hard, perhaps, as wet blotting-paper—but so completely formed, that the touch will leave a hole, which we may trace forward till the paper is perfectly made. The pulp does not flow over the sides of the plane, we observe, because a strap, on each side, constantly moving and passing upon its edges, regulates the width. After we pass the wheels upon which these straps terminate we perceive that the paper is sufficiently formed not to require any further boundary to define its size; the pulp has ceased to be fluid. But it is yet tender and wet. The paper is not yet completely off the plane of wire: before it quits it, another roller, which is clothed with felt, and upon which a stream of cold water is constantly flowing, subjects it to pressure. The paper has at length left what may be called the region of wire, and has entered that of cloth. A tight surface of flannel, or felt, is moving onward with the same regular march as the web of wire. Like the wire, the felt is what is called endless—that is, united at the extremities, as a jack-towel is. We see the sheet traveling up an inclined plane of this stretched flannel, which gradually absorbs its moisture. It is now seized between two rollers, which powerfully squeeze it. It goes traveling up another inclined plane of flannel, and then passes through a second pair of pressing-rollers. It has now left the region of cloth, and has entered that of heat. The paper, up to this point, is quite formed; but it is fragile and damp. It is in the

state in which, if the machinery were to stop here, as it did upon its first invention, it would require (having been wound upon a reel) to be parted and dried as hand-made paper is. But in a few seconds more it is subjected to a process by which all this labor and time is saved. From the last pair of cloth-pressing rollers, the paper is received upon a small roller which is guided over the polished surface of a large heated cylinder. The soft pulp tissue now begins to smoke; but the heat is proportioned to its increasing power of resistance. From the first cylinder, or drum, it is received upon a second, considerably larger, and much hotter. As it rolls over this polished surface, we see all the roughness of its appearance, when in the cloth-region, gradually vanishing. At length, having passed over a third cylinder, still hotter than the second, and having been subjected to the pressure of a blanket, which confines it to one side, while the cylinder smooths it on the other, it is caught upon the last roller, which hands it over to the reel. The last process of the machine is to cut the continuous length of paper into sheets.

In consequence of the cheaper production of the press, and the consequent extension of the demand for books, bookbinding has become a large manufacture, carried on with many scientific applications. We have rolling-machines, to make the book solid; cutting-machines, to supersede the hand-labor of the little instrument called a plow; embossing machines, to produce elaborate raised patterns on leather or cloth; embossing presses, to give the gilt ornament and lettering. These contrivances, and other similar inventions, have not only cheapened books, but have enabled the publisher to give them a permanent instead of a temporary cover, ornamental as well as useful. The number of persons employed has been quadrupled by these inventions. In 1830, the journeymen bookbinders of London

opposed the introduction of the rolling-machine. Books were formerly beat with large hammers upon a stone, to give them solidity. The workmen were relieved from the drudgery of the beating-hammer by the easy operation of the rolling-machine. They soon discovered the weak foundation of their objection to an instrument which, in truth, had a tendency, above all other things, to elevate their trade, and to make that an art which in one division of it was a mere labor. If the painter were compelled to grind his own colors and make his own frames, he would no longer follow an art, but a trade; and he would receive the wages of a laborer instead of the wages of an artist, not only so far as related to the grinding and frame-making, but as effecting all his occupations, by the drudgery attending a portion of them.

The commerce of literature has been doubled in twenty years. But it would be scarcely too much to assert that the influence of the press, in forming public opinion, and causing it to operate upon legislation, has doubled almost every other employment. The difficulty of procuring the material of paper has become a serious impediment to the cheap diffusion of knowledge; and in Great Britain the paper-tax works in the same evil direction. There have been innumerable obstacles to the extension of knowledge since the days when books were written on the papyrus—obstacles equally raised up by despotic blindness and popular ignorance. But it is not fitting that either of such causes should still be in action in the days of the printing-machine.

CHAPTER XXIV.

POWER OF SKILL.—CHEAP PRODUCTION.—POPULATION AND PRODUCTION.—PARTIAL AND TEMPORARY EVILS.—INTELLIGENT LABOR.—DIVISION OF LABOR.—GENERAL KNOWLEDGE.—THE LOWELL OFFERING.—UNION OF FORCES.

WE have thus, without pretending to any approach to completeness, taken a rapid view of many of the great branches of industry. We have exhibited capital working with accumulation of knowledge; we have shown labor working with skill. We desire to show that the counter-control to the absorbing power of capital is the rapidly developing power of skill—for that, also, is capital. Knowledge is power, because knowledge is property. Mr. Whitworth, whose Report on American Manufactures we have several times quoted, says that the workmen of the United States, being educated, perform their duty "with less supervision than is required when dependence is to be placed upon uneducated hands." He adds, "It rarely happens that a workman, who possesses superior skill in his craft, is disqualified to take the responsible position of superintendent, by the want of education and general knowledge, *as is frequently the case in Great Britain.*" One of the most essential steps toward the attainment of an elevated position on the part of the laborer, is the conviction that manual labor, to be effective, must adapt itself almost wholly to the direction of science; and that under that direction unskilled labor necessarily becomes skilled, and limited trust enlarges into influential responsibility.

Those who have taken a superficial view of the question of scientific application say, that only whenever there is a greater demand than the existing means can supply, is any new discovery in mechanics a benefit to society, because it gives the means of satisfying the existing want; but that, on the contrary, whenever the things produced are sufficient for the consumers, the discovery is a calamity, because it does not add to the enjoyments of the consumers; it only gives them a better market, which better market is bought at the price of the employment of the producers.

All such reasoning is false in principle, and unsupported by experience. There is no such thing, nor, if machines went on improving for five hundred years at the rate they have done for the last century, could there be any such thing as a limit to the wants of the consumers. The great mass of facts which we have brought together in this book must have shown that the cheaper an article of necessity becomes, the more of it is used; that when the most pressing wants are supplied, and supplied amply by cheapness, the consumer has money to lay out on new wants; that when these new wants are supplied cheaply, he goes on again and again to other new wants; that there are no limits, in fact to his wants as long as he has any capital to satisfy them. Bear in mind this—that the first great object of every invention and every improvement is to confer a benefit upon the consumers—to make the commodity cheap and plentiful. The working man stands in a double character; he is both a producer and a consumer. But we will be bold to say that the question of cheapness of production is a much more important question to be decided in his favor as a consumer, than the question of dearness of production to be decided in his favor as a producer. The truth is, every man tries to get as much as he can for his own labor, and to pay as little as he can for the labor of

others. If a mechanic, succeeding in stopping the machine used in his own trade, by any strange deviation from the natural course of things, were to get higher wages for a time, he himself would be the most injured by the extension of the principle. When he found his loaf cost him twenty-five cents instead of sixpence; when he was obliged to go to the river with his bucket for his supply of water; when his fuel cost ten dollars instead of five dollars; when he was told by the hosier that his stockings were advanced from a shilling a pair to five shillings; when, in fact, the price of every article that he uses should be doubled, trebled, and, in nine cases out of ten, put beyond the possibility of attainment—what, we ask, would be the use to him of his advance in wages? Let us never forget that it is not for the employment of laborers, but for the benefit of consumers, that labor is employed at all. The steam-engines are not working in the coal-pits of Pennsylvania, and the ships sailing from Philadelphia to Boston, to give employment to colliers and to sailors, but to make coals cheap in Boston. If the people of Boston could have the coals without the steam-engines and the ships, it would be better for them, and better for the rest of the world. If they could get coals for nothing, they would have more produce to exchange for money to spend upon other things; and the comforts, therefore, of every one of us would be increased.

This increase of comfort, some may say, is a question that more affects the rich than it affects the great mass. This, again, is a mistake. The whole tendency of the improvements of the last four hundred years has not only been to lift the meanest, in regard to a great many comforts, far above the condition of the rich four hundred years ago, but absolutely to place them, in many things, upon a level with the rich of their own day. They are surrounded, as we

have constantly shown throughout this book, with an infinite number of comforts and conveniences which had no existence two or three centuries ago ; and those comforts and conveniences are not used only by a few, but are within the reach of almost all men. Every day is adding something to our comforts. Our houses are better built—our clothes are cheaper—we have a number of domestic utensils, whose use even was unknown to our ancestors—we can travel cheaply from place to place, and not only travel at less expense, but travel ten times quicker than the richest man could travel two hundred years ago. The bulk of society is not only advancing steadily to the same level in point of many comforts with the rich, but is gaining that knowledge which was formerly their exclusive possession. Let all of us who are producers keep fast hold of that last and best power.

We have endeavored to show throughout this book that the one great result of machinery, and of every improvement in art, is to lessen the cost of production ; to increase the benefit to the consumer. But it is a most fortunate arrangement of the social state, as we have also shown, that cheap production gives increased employment. The same class of false reasoners who consider that the wants of society are limited, cry out, it is better to have a population of men than of steam-engines. That might be true if the steam-engines *did* put out the men ; but inasmuch as they increase the productions by which men are maintained, they increase the men. What has increased the population of England nearly tenfold during the last five hundred years but the improvement of the arts of life, which has enabled more men to live within the land ? There is no truth so clear, that as the productions of industry multiply, the means of acquiring these productions multiply also. The productions which are created by one producer furnish

the means of purchasing the productions created by another producer ; and, in consequence of this double production, the necessities of both the one and the other are better supplied. The multiplication of produce multiplies the consumers of produce. There are, probably, upon the average, no more hats made in the year than there are heads to wear them ; but as there are twenty millions of heads of American citizens in 1855, and there were only three millions of British colonial subjects in 1775, it is self-evident that the hat-makers have more than six times as much work as they had eighty years ago. What has given the hat-makers six times as much work ? The increase of the population. And what has increased the population ? The increase of produce—the increase of the means of maintaining that population. The great multiplication of produce is accompanied proportionately, with a far greater diminution of price.

There is a just and eloquent passage in the registrar-general's report upon the British census of 1851, which we gladly copy :

“ With all that we now see around us, it is difficult to place ourselves in the position of the people of 1751 ; and to understand either the simplicity of the means, or the greatness of the task which has since been achieved by the people of England and Scotland. It is evident, however, that if the whole that they have accomplished had been proposed as a project, or been held out as the policy of the greatest minister then living, its difficulty and grandeur would have overwhelmed him with confusion. If, in the height of power, he had thus addressed the people of Britain, would he not have been heard with justifiable incredulity ?—‘ These islands are occupied by the men of many separate states that are now happily united. After the settlement on the land of tribes, fleets, and armies of Celts, of Saxons, of Danes, and of Normans—and after cen-

turies of patient culture, its fertile soil sustains *seven millions* of people in its whole length. We can not—for the mighty power is not given us—say, let there be on the European shores of the Atlantic ocean, *three* Great Britains. But the means exist for creating on this land, in less than a hundred years, two more nations, each in number equal to the existing population, and of distributing them over its fields, in cottages, farms, and towns, by the banks of its rivers, and around its immemorial hills; and they will thus be neither separated by longer roads nor wider seas, but be neighbors, fellow-workers, and fellow-countrymen on the old territory; wielding by machines the forces of nature, that shall serve them with the strength of thousands of horses, on roads, and seas—in mines, manufactories, and ships. Subsistence shall be as abundant as it is now, and luxuries, which are confined to the few, shall be enjoyed by multitudes. The wealth of the country—its stock and its produce—shall increase in a faster ratio than the people. All this shall be accomplished without any miraculous agency, by the progress of society—by the diffusion of knowledge and morals—by improvements—and improvements chiefly in the institution of marriage—“that true source of human offspring,” whence,

“Founded in reason, loyal, just, and pure,
Relations dear, and all the charities
Of father, son, and brother, first were known.”

If the reader has rightly considered the various facts which we have presented, he will long before this have come to the conclusion, that it is for the general interests of society that every invention, which has a tendency to diminish the cost of production, shall have the most perfect freedom to go forward. He will also have perceived, that the exercise of this natural right, this proud distinction, of

man, to carry on the work of improvement to the fullest extent of his capacity and knowledge, can never be wholly stopped, however it may be opposed. It may be suspended by the ignorance of a government; it may be clamored down by the prejudice of a people; but the living principle which is in it can never be destroyed. To deny that this blessing, as well as many other blessings which we enjoy, is not productive of any particular evil, would be uncandid and unwise. Every change produced by the substitution of a perfect machine instead of an imperfect one, of a cheap machine instead of a dear one, is an inconvenience to those who have been associated with the imperfect and the dear machines. It is a change that more or less affects the interests of capitalists as well as of workmen. In a commercial country, in a highly civilized community, improvement is hourly producing some change which affects some interests. Every new pattern which is introduced in hardware deranges for a moment the interests of the proprietors of the old molds. Every new book, upon any specific subject upon which books have formerly been written, lessens the value of the copyright of those existing books. What then? Is every improvement, which thus produces a slight partial injury, to be discountenanced, because of this inevitable condition which we find at every step in the march of society? Or rather, ought we not to feel that every improvement brings healing upon its wings, even to those for whom it is a momentary evil; that if it displaces their labor or their capital for a season, it gives new springs to the general industry, and calls forth all labor and all capital to higher and more successful exertions? At every advance which improvement makes, the partial and temporary evils of improvement are more and more lessened. In the early stages of social refinement, when a machine for greatly diminishing labor is for the first time introduced, its effects

in displacing labor for an instant may be seen in the condition of great masses of people. It is the first step which is the most trying. Thus, when printing superseded the copies of books by writing, a large body of people were put out of employ; they had to seek new employ. It was the same with the introduction of the spinning machinery; the same with the power-loom. It would be presumptuous to say that no such great changes could again happen in any of the principal branches of human industry; but it may be said, that the difficulty of superseding our present expeditious and cheap modes of manufacture is daily increasing. The more machines are multiplied, that is, the more society approaches toward perfection, the less room is there for those great inventions which change the face of the world. We shall still go on improving, doubtless; but ingenuity will have a much narrower range to work in. It may perfect the machines which we have got, but it will invent fewer original machines. And who can doubt, that the nearer we approach to this state, the better will it be for the general condition of mankind? Who can doubt whether, instead of a state of society where the laborers were few and wretched, wasting human strength, unaided by art, in labors which could be better performed by wind, and water, and steam—by the screw and the lever—it would not be better to approach as nearly as we can to a state of society where the laborers would be many and lightly tasked, exerting human power in its noblest occupation, that of giving a direction by its intelligence to the mere physical power which it had conquered? Surely, a nation so advanced as to apply the labor of its people to occupations where a certain degree of intelligence was required, leaving all that was purely mechanical to machines and to inferior animals, would produce for itself the greatest number of articles of necessity and convenience, of luxury and

taste, at the cheapest cost. But it would do more. It would have its population increasing with the increase of those productions; and that population employed in those labors alone which could not be carried on without that great power of man by which he subdues all other power to his use—his reason.

But it is not only science which has determined, and is more and more determining, the condition of the great body of operatives, but the organization of industry upon the factory principle, so universal and so powerful, has rendered it impossible for the future that the larger amount of the labor of a country should be regarded as an insulated force. It must work in conjunction with higher and more powerful forces.

In France, which, as a commercial and manufacturing country, is considerably behind the advance of England or the United States, it was a common practice, in many villages and small towns, not very long ago, for the weavers to make the looms and other implements of their trade. In the fifteenth century, in the same country, before an apprentice could be admitted to the privilege of a master-weaver, it was not only necessary for him to prove that he understood his trade as a weaver, but that he was able to construct all the machines and tools with which he carried on his craft. Those who know any thing of the business of weaving will very readily come to the conclusion that the apprentice of the fifteenth century, whose skill was put to such a proof, was both an indifferent weaver and an indifferent mechanician; that in the attempt to unite two such opposite trades, he must have excelled in neither; and that in fact the regulation was one of those monstrous violations of the freedom of industry, which our ancestors chose to devise for the support of industry.

Carrying the principle of a division of labor to the other

extreme point, we have seen that a vast number of persons are engaged in the manufacture of a piece of cloth,* who, if individually set to carry the workmanship of that piece of cloth through all its stages, would be utterly incompetent to produce it at all, much less to produce it as durable and beautiful as the cloth which we all daily consume. How would the sorter of the wool, for example, know how to perform the business of the scourer, or of the dyer, or of the carder? or the carder that of the spinner or the weaver? or the weaver that of the miller, or boiler, or dyer, or brusher, or cutter, or presser? We must be quite sure that, if any arbitrary power or regulation, such as compelled the weaver of the fifteenth century to make his own loom, were, on the other hand, to compel a man engaged in any one branch of the manufacture of woollen cloth to carry that manufacture through all its stages, the production of cloth would be utterly suspended; and that the workmen being incompetent to go on, the wages of the workmen could no longer be paid; for the wages of labor are paid by the consumer of the produce of labor, and here there would be nothing to consume.

The great principle, therefore, which keeps the division of labor in full activity is, that the principle is necessary to production upon a scale that will maintain the number of laborers engaged in working in the cheapest, because most economical manner, through the application of that mode of working. The laborers, even if the principle were injurious to their individual prosperity and happiness, which we think it is not, could not dispense with the principle, because it is essential to economical production; and if dear production were to take the place of economical production, there would be a proportionately diminished de-

* See Chapter XIX.

would be produced, and a proportionate diminution of the number of producers.

The same laws of necessity which render it impossible for the working man to resist against the operation of the division of labor—even if it were desirable that they should resist against it, as if in their individual interests are concerned—render it equally impossible that they should resist against the operation of accumulation of knowledge in the direction of their labor. The mode in which accumulation of knowledge influences the direction of their labor is that it introduces mechanical and chemical aids to the capitalist in carrying on the business of production. The abandonment of these mechanical and chemical aids would equal production and not in the slightest degree increase, but greatly diminish, and ultimately destroy, the power of manual labor, seeking to work without those mechanical and chemical aids. The abandonment of the division of labor would work the same effects. There would be inequality in production on all sides; and the workmen on all sides, experiencing in their fullest extent the evils which result from diminished production, would all fall back in their condition, and day by day have less command of the resources and comforts of life, till they sank into utter destitution.

We dwell principally on the effects of accumulation of knowledge and division of labor on the working man as a consumer, because it is the more immediate object of this volume to consider such questions with reference to production. For the condition of the working man as a producer is taking the average of all ranks of producers, greatly advanced by the direction which capital gives to labor, by calling in accumulation of knowledge and division of labor. If the freedom of labor were not established upon the same imperishable basis as the security of property, we

might, indeed, think that it was a pitiable thing for a man to labor through life at one occupation, and believe that it was debasing to the human intellect and morals to make forever the eye of a needle, or raise a nap upon woolen cloth. The Hindoos, when they instituted their *castes*, which compelled a man to follow, without a possibility of emerging from it, the trade of his fathers, saw the general advantage of the division of labor; but they destroyed the principle which could make it endurable to the individual. They destroyed the freedom of industry. "To limit industry or genius, and narrow the field of individual exertion by any artificial means, is an injury to human nature of the same kind as that brought on by a community of possessions. Where there is no stimulus to industry, things are worst; where industry is circumscribed, they can not prosper; and are then only in a healthy state, when every avenue to personal advantage is open to every talent and disposition. A state of equality is an instance of the first case; the division of the people into castes, as among the Ancient Egyptians, and still among the Hindoos, of the second. This division has been considered by all intelligent travelers as one powerful cause of the stationary character of the inhabitants of that country: and the effect would have been still more pernicious, if time or necessity had not introduced some relaxation into the rigorous restrictions originally established, and so ancient as to be attributed to Siva. As long, however, as the rule is generally adhered to, that a man of a lower class is restricted from the business of a higher class, so long, we may safely predict, India will continue what it is in point of civilization. An approach to the same effect may be witnessed in the limitation of honors, privileges, and immunities in some countries of Europe."

In those manufactures and trades where the division of

labor is carried to the greatest extent, such as the manufacture of cotton and wool, workmen readily change from one branch to the other, without molestation, and without any great difficulty of adapting themselves to a new occupation. The simpler the process in which a workman has been engaged—and every process is rendered more simple by the division of labor—the easier the transition: and the principal quality which is required to make the transition is, that stock of general knowledge which the division of labor enables a man to attain; and which, in point of fact, is attained in much higher perfection in a large manufactory, than in that rude state where one man is more or less compelled to do everything for his body, and therefore has no leisure to do any thing for his mind. There are evils, undoubtedly, in carrying the division of labor to an extreme point; but we think that those very evils correct themselves, because they destroy the great object of the principle, and give imperfect instead of perfect production. The moral evils which some have dreaded may assuredly be corrected by general education, and in fact are corrected by the union of numbers in one employment. What sharpens the intellect ought, undoubtedly, to elevate the morals; and, indeed, it is only false knowledge which debases the morals. Knowledge and virtue, we believe, are the closest allies; and wisdom is the fruit of knowledge and virtue.

The same principles as to the course which the division of labor should lead the laborer to pursue, apply to the higher occupations of industry. No man of learning has ever very greatly added to the stock of human knowledge, without devoting himself, if not exclusively, with something like an especial dedication of his time and talents, to one branch of science or literature. In the study of nature we have the mathematician, the astronomer, the chemist,

the botanist, the zoologist, and the physician, engaged each in his different department. In the exposition of moral and political truths, we have the metaphysician, the theologian, the statesman, the lawyer, occupied each in his peculiar study or profession. A mental laborer, to excel in any one of these branches, must know something of every other branch. He must direct indeed the power of his mind to one department of human knowledge; but he can not conquer that department without a general, and, in many respects, accurate knowledge of every other department. The same principle produces the same effects, whether applied to the solution of the highest problem in geometry, or the polishing of a pin. The division of labor must be regulated by the acquisition of general knowledge.

There was probably no more striking example ever given of the union of factory labor with a taste for knowledge and an ardor for mental improvement, that was presented by the female operatives working in the cotton-manufactories of Lowell, in Massachusetts. They wrote and published for their own amusement, a magazine, called "The Lowell Offering," in which the writers exhibited remarkable attainments, and no common facility of composition. An English writer in commenting upon the publication of this magazine, used the following language:

"In dwelling upon the thoughts of others, in fixing their own thoughts upon some definite object, these factory girls have lifted themselves up into a higher region than is attained by those, whatever be their rank, whose minds are not filled with images of what is natural and beautiful and true. They have raised themselves out of the sphere of the partial and the temporary, into the broad expanse of the universal and the eternal. During their twelve hours of daily labor, when there were easy but automatic services to perform, waiting upon a machine—with that slight degree

of skill which no machine can ever attain—for the repair of the accidents of its unvarying progress, they may, without a neglect of their duty, have been elevating their minds in the scale of being by cheerful lookings-out upon nature; by pleasant recollections of books; by imaginary converse with the just and wise who have lived before them; by consoling reflections upon the infinite goodness and wisdom which regulates this world, so unintelligible without such a dependence. These habits have given them cheerfulness and freedom amid their uninterrupted toils. We see no repinings against their twelve hours' labor, for it has had its solace. Even during the low wages of 1842, which they mention with sorrow but without complaint, the same cultivation goes on. To the immense body of operatives elsewhere the example of what the girls of Lowell have done should be especially valuable. It should teach them that their strength, as well as their happiness, lies in the cultivation of their minds. To the employers of operatives, and to all of wealth and influence among us, this example ought to manifest that a strict and diligent performance of daily duties, in work prolonged even more than in our own factories, is no impediment to the exercise of those faculties, and the gratification of those tastes, which, whatever was once thought, can no longer be held to be limited by station. There is a contest going on among us, as it is going on all over the world, between the hard imperious laws which regulate the production of wealth, and the aspirations of benevolence for the increase of human happiness. We do not deplore the contest; for out of it must come a gradual subjection of the iron necessity to the holy influences of love and charity. Such a period can not, indeed, be rashly anticipated by legislation against principles which are secondary laws of nature; but one thing nevertheless is certain—that such an improvement of the opera-

tive classes, as all good men—and we sincerely believe among them the great body of manufacturing capitalists—ardently pray for, and desire to labor in their several spheres to attain, will be brought about in a parallel progression with the elevation of the operatives themselves in mental cultivation, and consequently in moral excellence.”*

The division of labor in carrying forward the work of production is invariably commanded, because it is perfected, by the union of forces, or co-operation. The process of manufacturing a piece of woolen cloth is carried on by division of labor, and by union of forces, working together. In fact, if there were not that ultimate co-operation, the division of labor would be not only less productive than labor without division, but it would not be productive at all. The power of large capital is the power which, as society is arranged, compels this division of parts for the more complete production of a whole. A large cloth manufactory, as we have seen, exhibits itself to the eye chiefly in the division of labor; but all that division ends in a co-operation for the production of a piece of cloth. A ship, with five hundred men on board, each engaged in various duties, and holding different ranks, is an example of the division of labor, but the division ends in a co-operation to carry the ship from one port to another, and, if it be a ship of war, to defend it from the attacks of an enemy. Those who would direct the principle of co-operation into a different channel, by remodeling society into large partnerships, do not, because they can not depart, in the least degree, from the principles we have laid down. They must have production, and therefore they must have division of labor; the division of labor involves degrees of skill; the whole requires to be carried on with accumulation of former

* “Mind among the Spindles;” in the series called “Knight’s Weekly Volume.”

labor or capital, or it could not exist. The only difference proposed is, that the laborers shall be the capitalists, and that each shall derive a share in the production, partly from what now is represented as his profits as a capitalist, and partly from what is represented as his wages as a laborer; but that all separate property shall be swallowed up in joint property. But we mention this subject here to show that even those who aspire to remodel society can not change the elements with which it is now constructed, and must work with the same principles, however different may be the names of those principles, and however varied in their application. This is in favor even of the ultimate success of the principles of co-operation, if they should be found practically to work for the increase of the happiness of mankind; which would not be effected by equalizing the distribution of wealth, if, at the same time, its production were materially checked. This view of the subject goes to show that no sudden or violent change is necessary. In many things society has always acted on the principles of co-operation. As civilization extends, the number of instances has hitherto increased; and if there is no natural maximum to the adoption of these principles (which remains to be seen), men may gradually slide more and more into them, and realize all sane expectations, without any reconstruction of their social system—any pulling down and building up again of their morals or their houses.

It is this union of forces which, whether it prevail in a single manufactory, in a manufacturing town viewed in connection with that manufactory, in an agricultural district viewed in connection with a manufacturing town, in a capital viewed in connection with both, in a State viewed in connection with all its parts, and in the whole world viewed in connection with particular States; it is this union of forces which connects the humblest with the highest in the

production of utility. The poor lad who tends sheep, and the capitalist who spends thousands of pounds for carrying forward a process to make the wool of these sheep into cloth, though at different extremities of the scale, are each united for the production of utility. The differences of power and enjoyment (and the differences of enjoyment are much less than appear upon the surface) between the shepherd-boy and the great cloth-manufacturer, are apparently necessary for the end of enabling both the shepherd-boy and the capitalist to be fed, and clothed, and lodged, by exchanges with other producers. They are also necessary for keeping alive that universal, and, therefore, as it would appear, natural desire for the improvement of our condition, which, independently of the necessity for the satisfaction of immediate wants, more or less influences the industry of every civilized being as to the hopes of the future. It is this union which constitutes the real dignity of all useful employments, and may make the poorest laborer feel that he is advancing the welfare of mankind as well as the richest capitalist; and that, standing upon the solid foundation of free exchange, the rights of the one are as paramount as the rights of the other, and that the rights of each have no control but the duties of each. We believe that the interests of each are also inseparably united, and that the causes which advance or retard the prosperity of each are one and the same.

CHAPTER XXV.

ACCUMULATION.—PRODUCTIVE AND UNPRODUCTIVE CONSUMPTION.—USE OF CAPITAL.—CREDIT.—SECURITY OF PROPERTY.—PRODUCTION APPLIED TO THE SATISFACTION OF COMMON WANTS.—INCREASE OF COMFORTS.—RELATIONS OF CAPITALIST AND LABORER.

DR. WILLIAM BULLEYN, who lived three centuries ago, first gave currency to the saying, that great riches were "like muckhills, a burden to the land and offensive to the inhabitants thereof, till their heaps are cast abroad, to the profit of many." The worthy physician belonged to an age when the class called misers extensively prevailed; and when those who lent out money upon interest were denominated usurers. They were generally objects of public obloquy, and their function was not understood. There are plenty of men still among us who, in Dr. Bulleyn's view of the matter, are impersonations of the muck that is not spread. The muck-spreaders, according to the old notion, were those whose consumption were always endeavoring to outstrip the production that was going forward around them. The latter is by far the larger class at the present day; the former, the more powerful.

Let us endeavor, somewhat more with reference to practical results than we have already attempted, to look at some of the general principles existing in modern society which determine the existence and regulate the employment of capital.

Whatever is saved and accumulated is a saving and accumulation of commodities which have been produced. The

value of the accumulation is most conveniently expressed by an equivalent in money; but only a very small part of the accumulation is actually money. A few millions of bullion are sufficient to carry on the transactions of this country. Its accumulations, or capital, which have been considered to amount to twenty-two hundred million pounds sterling, could not be purchased by several times the amount of all the bullion that exists in the world. A great part of what is saved, therefore, is an accumulation of products suitable for consumption. The moment that they are applied to the encouragement of production, they begin to be consumed. They encourage production only so far as they enable the producers to consume while they are in the act of producing. Accumulation, therefore, is no hinderance to consumption. It encourages consumption as much as expenditure of revenue unaccompanied by accumulation. It enables the things consumed to be replaced, instead of being utterly destroyed.

Whatever is consumed by those who are carrying forward the business of production has been called productive consumption. Whatever, on the other hand, is consumed by those who are not engaged in re-producing, has been called unproductive consumption. The difference may be thus illustrated: A shoemaker, we will say, rents a shop, works up leather and other materials, uses various tools, burns out candles, and is himself fed and clothed while in the act of producing a pair of shoes. This is productive consumption; for the pair of shoes represents the value of the materials employed in them, the commodities consumed by the shoemaker during their production, and the wear and tear of the tools applied in making them. If the shoes represent a higher value than what has been consumed, in consequence of the productiveness of the labor of the shoemaker, the difference is net produce, which may be saved,

and, with other savings, become capital. But further: the shoemaker, we will suppose, accumulates profits sufficient to enable him to live without making shoes, or applying himself to any other branch of industry. He now uses no materials, he employs no tools, but he consumes for the support and enjoyment of existence, without adding any thing to the gross produce of society; this is called unproductive consumption.

The differences, however, between productive and unproductive consumption admit of considerable qualification. We have already described the course of a spendthrift, and of a man of fortune who lives virtuously and economically. Whatever may be the scientific definition, no one can say that these, even viewed from the industrial point, can be classed together as unproductive consumers. Productive consumption, according to the strict definition of the earlier economists, is consumption directly applied to the creation of some material product. But a new element was introduced into the question by Mr. Mill's definition—that labor and expenditure are also productive, “which, without having for their direct object the creation of any useful natural product, or bodily or mental faculty or quality, yet lead indirectly to promote one or other of those ends.” On the other hand, unproductive consumption consists of labor and expenditure exerted or incurred “uselessly, or in pure waste, and yielding neither direct enjoyment nor permanent sources of enjoyment.”

It has been suggested by Dr. Cooper, that the parable of “the ten talents,” in St. Matthew's Gospel, points to the employment of capital for future production. “For the kingdom of heaven is as a man traveling into a far country, who called his own servants, and delivered to them his goods. And unto one he gave five talents, to another two, and to another one; to every man according to his several

ability; and straightway took his journey. Then he that had received the five talents went and traded with the same, and made them other five talents. And likewise he that had received two, he also gained other two. But he that had received one, went and digged in the earth, and hid his lord's money." The last was the "wicked and slothful," because unprofitable servant. His was the sin of omission. He ought to have put out the money to "the exchangers," even if he had been afraid to trade with it.

Adam Smith has laid it down as an axiom that the proprietor who encroaches upon his capital by extravagance and waste is a positive destroyer of the funds destined for the employment of productive labor. No doubt this is, in many respects, true. He, also, has buried his "one talent." But the common opinion of what are called "the money-making classes" of our time goes somewhat further than this. It is frequently said that "the life of a man who leaves no property or family provision, of his own acquiring at his death, is felt to have been a *failure*."* There are many modes in which the life of an industrious, provident, and able man may have been far other than "a failure," even in a commercial point of view, when he leaves his family with no greater money inheritance than that with which he began the world himself. He may have preserved his family, during the years in which he has lived among them, in the highest point of efficiency for future production. He may have consumed to the full extent of his income, producing, but accumulating no money capital for reproductive consumption; and indirectly, but not less certainly, he may have accumulated while he has consumed, so as to enable others to consume profitably. If he have had sons, whom he has trained to manhood, bestowing upon them a liberal

* An Essay on the "Relations between Labor and Capital." By C. Morison, p. 34.

education; bringing them up, by honest example, in all trustworthiness; and causing them to be diligently instructed in some calling which requires skill and experience—he is an accumulator. If he have had daughters, whom he has brought up in habits of order and frugality, apt for all domestic employments, instructed themselves, and capable of carrying forward the duties of instruction—he has reared those who, in the honorable capacity of wife, mother, and mistress of a family, influence the industrial powers of the more direct laborers in no small degree; and, being the great promoters of all social dignity and happiness, create a noble and virtuous nation. By the capital thus spent in enabling his children to be valuable members of society, he has accumulated a fund out of his consumption which may be productive at a future day. He has postponed his money contribution to the general stock; but he has not withheld it altogether. He has not been “the wicked and slothful servant.” On the other hand, many a man, whose life, according to the mere capitalist doctrine, has not been “a failure,” and who has taught his family to attach only a money-value to every object of creation, bequeaths to the world successors whose rapacity, ignorance, unskillfulness, and improvidence, will be so many charges upon the capital of the nation. The “muckhill” will by them be “cast abroad,” but it will be devoted to the mere pursuit of sensual indulgence, losing half its fertilizing power, and too often burning up the soil that its judicious application would stimulate. He that has been weak enough, according to this “middle-class” doctrine, not to believe that the whole business of man is to make a “muckhill,” may have spent his existence in labors, public or private, for the benefit of his fellow-creatures; but his life is “a failure!” The greater part of the clergy, of the bar, of the medical profession, of the men of science and literature, of the defenders

of their country, devote their minds to high duties, and some to heroic exertions, without being inordinately anxious to guard themselves against such "a failure." It would, perhaps, be well if some of those who believe that all virtue is to be resolved into dollars and cents, were to consider that society demands from "the money-making classes" a more than ordinary contribution—not to indiscriminate benevolence, but to those public instruments of production—educational institutions—improved sanitary arrangements—which are best calculated to diminish the interval between the very rich and the very poor.

Whatever tends to enlighten the great body of the people facilitates individual accumulation. A large portion of the productions of industry, especially among the humbler classes of the community, is wasted, in addition to that portion which is enjoyed. Every consumption that is saved by habits of order, by knowing the best way of setting about a thing, by economy in the use of materials, is so much saved of the national capital; and what is saved remains to give new encouragement to the labor of the producer, and to bestow an increase of comforts upon the consumer. Again, the more that professional skill of every sort is based upon real knowledge, the more productive will be the industry of every class of laborers. Above all, sound morals, and pure and simple tastes, are the best preservatives from wasteful expenditure, both in the rich and in the poor; and he that limits his individual gratification to objects worthy of a rational being, has the best chance of acquiring a sufficiency for his wants, and of laying by something to provide a fund for that productive consumption by which the wants of others are supplied.

With these general remarks upon accumulation and consumption, let us proceed to consider some points connected with the application of capital.

The use of capital consists in its advance. It goes before all operations of labor and trade. It is the power that sets labor and trade in motion; just as the power of wind, or water, or steam, gives movement to wheels and pistons.

Let us briefly see how capital operates upon the three great branches of human industry, namely, upon agriculture, manufactures, and commerce.

A farmer having acquired capital, either by the former savings of himself or his fathers, or by borrowing from the savings of others, takes a certain number of acres of land. He changes his capital of money into other things which are equally capital; into horses, and cows, and sheep, and agricultural instruments, and seed. He makes an advance in the hope of producing a profit. He therefore sets his horses to work; he gets milk from his cows; he shears his sheep; he fattens his oxen; and he put his tools into the hands of laborers, to prepare the ground for the reception of his seed. He is paying money away on every side, which he would not do if he did not expect a return, with a profit. By all these operations—by the work of his horses and his laborers—by the increase in number, and the increase in value of his flocks and herds—and by the harvest after the seed-time—new produce is created which produces a return of capital, and ought to produce a profit if that capital is properly expended. The hope of profit sets the capital to work, and the capital sets the labor to work. If there were no capital there would be no labor. Capital gives the laborer the power, which he has not in himself, of working for a profit.

A capitalist desires to set up a cotton manufactory. He erects buildings, he purchases machines, he buys cotton, he engages workmen. The annual value of the buildings and of the machines—that is, the interest upon their cost, added to their loss by wear and tear—the price of the raw mate-

rial, and the wages of the workmen, are all calculated to be paid out of the price at which the cotton-cloth will be sold. To engage in such large undertakings, in which the returns are slow, there must be great accumulation of capital. To engage in such large undertakings, in which the risk is considerable, there must be abundant enterprise. Without extensive accumulations of capital, which produce enterprise, they could not be engaged in at all.

Capital employed in commerce circulates through the world in a thousand forms; but it all comes back in produce to the country that sends it out. Nations that have no accumulated stock—that is, no capital—have no commerce; and where there is no commerce there are no ships and no sailors; and there are no comforts besides those which spring up at the feet of the more fortunate individuals of such nations.

In all these operations of capital upon the enterprises of agriculture, manufactures, and commerce, another power, which is the result of accumulation, is more or less, in most cases, called into action. That power is credit.

Credit, upon a large scale, arose from the difficulty of transmitting coined money from place to place, and particularly from one country to another; and hence the invention of bills of exchange. A bill of exchange is an order by one person on another, to pay to a specified person, or his order, a sum of money specified, at a certain time and a certain place. It is evident that the bill of exchange travels as much more conveniently than a bag of money, as the bag of money travels more conveniently than the goods which it represents. For instance, a box of hardware from Philadelphia might be exchanged for a case of wine from Bordeaux, by a direct barter between the merchant at Philadelphia and the tradesman at Bordeaux; but this sort of operation must be a very limited one. Through

the agency of merchants, the hardware finds its way to Bordeaux, and the wine to Philadelphia without any direct exchange between either place, or without either having more of the commodity wanted than is required by the market—that is, the supply proportioned to the demand of each town. Through the division of labor, the merchant who exports the hardware to Bordeaux, and the merchant who imports the wine from Bordeaux, are different people; and there are other people engaged in carrying on other transactions at and with Bordeaux, with whom these merchants come in contact. When, therefore, the merchant at Bordeaux has to pay for the hardware in the United States, he obtains a bill of exchange from some other merchant who has to receive money from the United States, for the wine which he has sent there. And thus not only is there no direct barter between the grower of the wine and the manufacturer of the hardware, but the wine and the hardware are each paid for without any direct remittance of coined money from France to America, but by a transfer of the debt due from one person to another in each country. By this transfer, the transaction between the buyer and the seller is at once brought to maturity; and by this operation the buyer and seller are each benefited, because the exchange which each desires is rendered incomparably more easy, because more speedy and complete. The same principle applies to transactions between commercial men in the same country. The order for payment, which stands in the place of coined money in one case, is called a foreign bill of exchange; in the other an inland bill of exchange.

The operation of credit in a country whose industry is in an advanced state of activity, is extended over all its commercial transactions, by the necessity of obtaining circulating capital for the carrying forward the production of any commodity, from its first to its last stages. A manufac-

turer has a large sum expended in workshops, warehouses, machinery, tools. This is called his fixed capital. He has capital invested also in the raw material which he intends to convert into some article of utility. He works up his raw material; he makes advances for the labor required in working it up. The article is at length ready for the market. The wholesale dealer, who purchases of the manufacturer, sells to a retailer, who is in the habit of buying upon credit, long or short, because the article remains a certain time in his hands before it reaches the consumer, who ultimately pays for it. From the time when a fleece of wool is taken from the sheep's back in Australia, till it is purchased in the shape of a coat in London, there are extensive outlays in every department, which could not be carried on steadily unless there were facilities of credit from one person concerned in the production to another person concerned in the production—the whole credit being grounded upon the belief that the debt contracted in so many stages will be repaid by the sale of the cloth to the consumer. The larger operations of this credit are represented by bills of exchange, or engagements to pay at a given date; and these bills being converted into cash by a banker, furnish a constant supply of consumable commodities to all parties concerned in advancing the production, till the produce arrives in the hands of the consumer. To judge of the extent to which credit is carried in England, it is only necessary to mention, that £5,000,000 sterling are daily paid in bills and checks by the London bankers alone; that the Bank of England alone, in 1853, discounted bills to the amount of £25,000,000 sterling; and that the note circulation of Great Britain is about £40,000,000. Credit, undoubtedly, if conducted upon fair principles, represents some capital actually in existence, and therefore does not really add to the accumulation or capital of the

producers. But it enables men in trade at once to have stock and circulating capital—to use even their houses, and shops, and manufactories, and implements; and to give, at the same time, a security to others upon that fixed capital. This process is, as it were, as if they coined that fixed capital. The credit, which is rendered as secure as possible in all its stages by the accumulating securities of the drawer, acceptor, and endorsers of a bill of exchange, brings capital into activity—it carries it directly to those channels in which it may be profitably employed—it conducts it to those channels by a systematic mode of payment for its use, which we call interest, or discount; and it therefore carries forward accumulation to its highest point of productiveness.

If the reader will turn to the passage in the chapter, where Tanner describes the refusal of the traders to give him credit, he will see how capital, advanced upon credit, sets industry in motion. The Indians had accumulated no store of skins to exchange for the trader's store of guns, ammunition, traps, and blankets. The trader, although he possessed the articles which the Indians wanted, refused to advance them upon the usual credit; and they were consequently as useless to the Indians as if they had remained in a warehouse across the Atlantic. When the credit was taken away from the Indians, they could no longer be exchangers. Their own necessities for clothing were too urgent to enable them to turn their attention from that supply to accumulate capital for exchange, after the winter had passed away. They hunted only for themselves. The trader went without his skins, and the Indians without their blankets. Doubtless, the keenness of commercial activity soon saw that this state of things was injurious even to the more powerful party, for the accustomed credit was presently restored to the Indians. It was the only means by

which that balance of power could be quickly restored which would enable the parties again to become exchangers. Every exchange presupposes a certain equality in the exchangers ; and credit, therefore, from the capitalist to the non-capitalist, must, in many cases, be the first step toward any transaction of mutual profit. If the Indians had adopted the resolution of Tanner, to do without the blankets for the winter, and had substituted the more imperfect clothing of skins—and if the traders had persevered in their system refusing credit, that is, of advancing capital—the exchange of furs must have been suspended, until, by incessant industry, and repeated self-denial, the Indians had become capitalists themselves. They probably, after a long series of laborious accumulations, might have done without the credit—that is, have not consumed the goods which they received before they were in a condition to give their own goods as equivalents ; and then, as it usually happens in the exchanges of civilized society, they would have insured a higher reward for their labor. The credit rendered the labor of the Indians less severe, inasmuch as it allowed them to work with the aid of the accumulations of others, instead of with their own accumulations. But it doubtless gave the traders advantage, and justly so, in the terms of the exchange. If the Indians had brought their furs to the mart where the dealers had brought their blankets, there would have been exchange of capital for capital. As the Indians had not accumulated any furs, and were only hoping to accumulate, there was, on the part of the white traders, an advance of a present good for a remote equivalent. The traders had doubtless suffered by the casualties which prevented the Indians completing their engagements. They made a sudden, and therefore an unjust, change in their system. The forbearance of the Indians shows their respect for the rights of property, and their consequent appreciation

of their own interests. They might, possessing the physical superiority, have seized the blankets and ammunition of the traders. If so, their exchanges would have been at an end; the capital would have gone to stimulate other industry; the Indians would have ripped up the goose with the golden eggs.

It is easy to see that the employment of capital, through the agency of credit, in all the minute channels of advanced commerce, must wholly depend upon the faith which one man has in the stability and the honesty of another; and also upon the certainty of the protection of the laws which establish security of property, to enforce the fulfilment of the contract.

It is necessary to establish this point of the security of property, as one of the rights, and we may add as the greatest right, of industry; and therefore, at the risk of being thought tedious, we may call attention to the general state of the argument in reply to some who hold that the rights of property, and the rights of labor, are antagonistic.

The value of an article produced is the labor required for its production.

Capital, the accumulation of past labor, represents the entire amount of that labor which is not consumed; it is the old labor stored up for exchange with new labor.

Those who attach an exclusive value to new labor as distinguished from old labor—or labor as distinguished from capital—say that the new production shall be stimulated by the old production, without allowing the old production to be exchanged against the new; that is, that the old production shall be an instrument for the reward of new labor, but not a profitable one to its possessor.

The doctrine therefore amounts to this; that labor shall be exchanged with labor, but not with the produce of labor—or that there shall be no exchange whatever; for if the

present laborers are to have the sole benefit of the capital, the principle of exchange, in which both exchangers benefit, is destroyed. There must be an end of all exchanges when the things to be exchanged are not equally desired by both parties. If the capitalist is to lend or give the capital to the laborer without a profit, or without a perfect freedom which would entitle him to withhold it if no profit could be obtained, the balance is destroyed between capital and labor. Accumulation is then at an end; because the security of the thing accumulated to the accumulator is at an end. The security is at an end, because if the new labor is to have the advantage of the old labor without compensation or exchange, the new labor must take the old labor by force or fraud; for the new can not proceed without the old; labor can not stir without capital. Accumulation, therefore being at an end, labor for an object beyond the wants of an hour is at an end. Society resolves itself into its first elements.

Strabo, the ancient geographer, has described a tribe among whom the title of the priest to the priesthood was acquired by having murdered his predecessor; and consequently the business of the priest in possession was not to discharge the duties of the priesthood, but to watch, sword in hand, to defend himself against the new claimant to the office. If the principle were to be recognized, that the accumulation of *former* labor belongs to the *present* laborers; and that the best title to the accumulation is to have added nothing toward it, but only to be willing to add—the title of the laborers in possession would require to be maintained by a constant encounter with new claimants; as the priest of Strabo, who had dispossessed the previous priest, had to dread a similar expulsion from his office, by a new violence.

The course of national misery resulting from national dis-

orders always begins with financial embarrassment; by the destruction of capital, or its withdrawal from all useful works. Capital was circulated only because it could be circulated with security. If the present capitalists were driven away, as some reasoners would imply might easily be done, and the laborers were left to work the tools and steam-engines—to labor in the manufactories, and to inhabit the houses of the present capitalists—production could not go on an hour, unless the appropriation of the plunder were secured to the individual plunderers.

In speaking of credit, then, we naturally turn to the only foundation upon which credit rests—the security of property. Commercial men, who know how easily credit is destroyed by individual guilt or imprudence, also know how easily it is interrupted, generally by a combination of circumstances over which an individual, apart from a nation, has no control. The instant that any circumstances take place which weaken the general confidence in the security of property, credit is withdrawn. The fixed capital remains—the tools and warehouses stand—the shops are open; but production languishes, labor is suspended. The stocks of consumable commodities for the maintenance of labor may still in part exist, but they do not reach the laborer through the usual channels. Then men say, and say truly, confidence is shaken; the usual relations of society are disturbed. Capital fences itself round with prudence—hesitates to go on accumulating—refuses to put its existence in peril—withdraws in great part from production—

"Spreads its light wings, and in a moment flies."

Within the last few years we have had before our eyes a fearful example of the universal evil created by the sudden loss of confidence in the security of property. The revolu-

tion of 1848 in France, which overthrew the government of Louis Philippe, was associated with a general belief that the whole fabric of society in that country was about to be shaken in the overthrow of capital. The capital was instantly withdrawn from circulation; there was no exchange; there was no labor. The more immediate sufferers were the workmen themselves; and the mode in which the ruling power relieved them by giving forced employment was wholly unavailing, except as a temporary expedient. After several dreadful months of tumult and bloodshed, a little confidence was restored by the pressure of an armed force; and when at length a government was established that rested upon security of property, it was hailed as the greatest of all blessings, although accompanied with some evils to which Americans, especially, can not shut their eyes. When capital and labor could once more work in a safe union, France quickly developed those great natural resources with which she is blessed; and the ingenuity of her people was again called into activity, to carry forward and perfect those resources by higher and higher exertions of science and skill.

When the great body of the people of a country are so generally educated as to know that it is the interest of the humblest and the poorest that property shall be secure, there will be little occasion for fencing round property with guards, against the secret violence of the midnight robber, or the open daring of the noonday mob. "It is an enlightened moral public sentiment that must spread its wings over our dwellings, and plant a watchman at our doors."* A very little insecurity destroys the working of capital. The cloth trade of Verviers, a town in France, was utterly ruined, because the morals of the people in the

* Everett's "Address to the Working Man's Party"

town were so bad, and the police so ineffectual, that the thefts in the various stages of the manufacture amounted to eight per cent. upon the whole quantity produced. The trade of the place, therefore, was destroyed; and the capital went to encourage labor in places where the rights of property were better respected.

But, generally speaking, the security of property is not so much weakened by plunder, as by those incessant contentions which harass the march of capital and labor; and keep up an irritation between the classes of the capitalists and the laborers, who ought to be united in the most intimate compact for a common good. These irritations most frequently exhibit themselves in the shape of combinations for the advance of wages. We have no hesitation in declaring our opinion that it is the positive duty of the working-man to obtain as high wages as he can extract out of the joint products of capital and labor; and that he has an equal right to unite with other workmen in making as good a bargain as he can, consistently with the rights of others, for his contribution of industry to the business of production. But it is also necessary for us to declare our conviction that, in too many cases, the working men attempt an object which no single exertion, and no union however formidable or complete, can ever accomplish. They attempt to force wages beyond the point at which they could be maintained, with reference to the demand for the article produced; and if they succeed they extinguish the demand, and therefore extinguish the power of working at any wages. They drive the demand, and therefore the supply, into new channels; and they thrust out capital from among them, to work in other places where it can work with freedom and security. Above all, such combinations, and the resistance which they call up, have a tendency to loosen the bonds of mutual regard which ought to

subsist between capitalists and laborers. Their real interests are one and the same.

All men are united in one bond of interests, and rights, and duties; and although each of us have particular interests, the parts which we play in society are so frequently changing, that under one aspect we have each an interest contrary to that which we have under another aspect. It is in this way that we find ourselves suddenly bound closely with those against whom we thought ourselves opposed a moment before; and thus no class can ever be said to be inimical to another class. In the midst, too, of all these instantaneous conflicts and unions, we are all interchangeably related in the double interest of capitalists and consumers—that is, we have each and all an interest that property shall be respected, and that production shall be carried forward to its utmost point of perfection, so as to make its products accessible to all. The power of production, in its greatest developments of industry, is really addressed to the satisfaction of the commonest wants. If production, as in some despotic countries, were principally laboring that some men might wear cloth of gold while others went naked, then we should say that production was exclusively for the rich oppressor. But, thank God, the man who *exclusively* wears “purple and fine linen every day” has ceased to exist. The looms do not work for him alone, but for the great mass of the people. It is to the staple articles of consumption that the capitals of manufactures and commerce address their employment. Their employment depends upon the ability of the great body of the people to purchase what they produce. The courtiers of the fifteenth century in France carried boxes of sugar-plums in their pockets, which they offered to each other as a constant compliment; the courtiers of the next age carried gingerbread in the same way; and lastly, the luxury of

snuff drove out the sugar-plums and the gingerbread. But the consumption of tobacco would never have furnished employment to thousands, and a large revenue to the state, if the use of snuff had rested with the courtiers. The producers, consequently, having found the largest, and therefore the most wealthy class of consumers among the working men, care little whether the Peer wears a silk or a velvet coat, so that the Peasant has a clean shirt. When capital and labor work with freedom and security, the wants of all are supplied, because there is cheap production. It is a bad state of society where

"One flaunts in rags, one flutters in brocade."

Those who like the brocade may still wear it in a state of things where the rights of industry are understood; but the rags, taking the average condition of the members of society, are banished to the lands from which capital is driven—while those who labor with skill, and, therefore, with capital, have decent clothes, comfortable dwellings, wholesome food, abundant fuel, medical aid in sickness, the comfort and amusement of books in health. These goods, we have no hesitation in saying, all depend upon the security of property; and he that would destroy that security by force or fraud is the real destroyer of the comforts of those humbler classes whose rights he pretends to advocate.

The principles which we maintain, that the interests of all men, and of the poorer classes especially, are necessarily advanced in a constantly increasing measure by the increase of capital and skill, have been put so strikingly by a philosophical writer, that we can not forbear quoting so valuable an authority in support and illustration of our opinions:

"The advantage conferred by the augmentation of our physical resources, through the medium of increased knowl-

edge and improved art, have this peculiar and remarkable property—that they are in their nature diffusive, and can not be enjoyed in any exclusive manner by a few. An eastern despot may extort the riches and monopolize the art of his subjects for his own personal use; he may spread around him an unnatural splendor and luxury, and stand in strange and preposterous contrast with the general penury and discomfort of his people; he may glitter in jewels of gold and raiment of needle-work; but the wonders of well-contrived and executed manufacture which we use daily, and the comforts which have been invented, tried, and improved upon by thousands, in every form of domestic convenience, and for every ordinary purpose of life, can never be enjoyed by him. To produce a state of things in which the physical advantages of civilized life can exist in a high degree, the stimulus of *increasing comforts and constantly elevated desires* must have been felt by millions; since it is not in the power of a few individuals to create that wide demand for useful and ingenious applications, which alone can lead to great and rapid improvements, unless backed by that arising from the speedy diffusion of the same advantages among the mass of mankind.”*

In looking back upon all the various circumstances which we have exhibited as necessary for carrying industry to the greatest point of productiveness, we think that we must have established satisfactorily that the two great elements which concur in rendering labor in the highest degree beneficial, are, first, the accumulated results of past labor; and second, the contrivances by which manual labor is assisted—those contrivances being derived from the accumulations of knowledge. Capital and skill, therefore, are essential to the productive power of labor. The different degrees in which each possesses capital and skill make the difference

* Sir John Herschel's "Discourse on the Study of Natural Philosophy."

between a New England manufacturer and a North American savage; and the less striking gradations in the productive power of the manufacturer of the present time, and the manufacturer of five hundred years ago, may be all resolved into the fact that one has at his command a very large amount of capital and skill, and that the other could only command a very small amount of the same great elements of production.

We think, also, that we have shown that the accumulation of former labor in the shape of tangible wealth, and the accumulation of former labor in the shape of the no less real wealth of knowledge, are processes which go on together, each supporting, directing, and regulating the other. Knowledge is the offspring of some leisure resulting from a more easy supply of the physical wants; and that leisure can not exist unless capital exists, which allows some men to live upon former accumulations. Capital, therefore, may be said to be the parent of skill, as capital and skill united are the encouragers and directors of profitable labor.

We have shown that the only foundation of accumulation is security of property; we have shown, too, that labor is the most sacred of properties. It results, therefore, that in any state of society in which the laws did not equally protect the capitalist and the laborer as free exchangers, each having the most absolute command over his property, compatible with a due regard to the rights of the other—in such a state where there was no real freedom and no real security, there would be very imperfect production; and production being imperfect, all men, the capitalists and the laborers, would be equally destitute, weak, ignorant, and miserable.

It is under these several conditions, all working together with united force, that the entire labor of this country, and

indeed, of all other countries advanced in civilization, must now be directed. The enormous increase of productiveness which we have exhibited, in so many operations of industry, is chiefly the result of production carried on upon a large scale, and working with every possible application of science. It is in this sense that Knowledge is Power; and skilled labor is a part of that power.

The mode in which the respective proportions of capitalist and laborer are assigned in the division of the products of industry, are called by one, profit, by the other, wages. If we were writing a treatise on Political Economy, we should have to regard rent as distinct from the profits of capital. But for our purpose this is unnecessary. We proceed, then, to consider the practical relations of profit and wages, as they exist among us. Unquestionably, the only solid foundation for these relations must be equal justice; without which there can be neither permanent prosperity nor increasing intelligence.

CHAPTER XXVI.

NATURAL LAWS OF WAGES.—STATE-LAWS REGULATING WAGES.—ENACTMENTS REGULATING CONSUMPTION.—THE LABOR-FUND AND THE WANT-FUND.—RATIO OF CAPITAL TO THE POPULATION.—STATE OF INDUSTRY AT THE END OF THE SEVENTEENTH CENTURY.—RISE OF MANUFACTURES.—WAGES AND PRICES.—TURNING OVER CAPITAL.

THE old chroniclers relate that the Norman king, Henry I., had once a terrible vision, of soldiers, and priests, and peasants, surrounding his bed, one band succeeding another, and threatening to kill him. The legend became the subject of illuminated drawings in an ancient MS. preserved at Oxford, and one of these represented the tillers of the land, with spade, and fork, and scythe, demanding justice. The cultivators were loaded with heavy exactions, so great that the tenants of the crown even offered to give up their plows to the king. They plowed, but they reaped not themselves. In such a state of things there could be no accumulation, and no profitable labor. The funds for supplying the wages of labor were exhausted. The country was depopulated.

During the next two centuries, the condition of the English people had been materially improved. Capital had increased, and so had population. But capital had increased faster than population, and hence the improvement. The class of free laborers had for the most part succeeded to the old class of villeins. Laborers for hire, without understanding the great principles which govern the rate of wages, any more than did their masters, would practically seek to

measure their earnings according to those principles. The lawgivers determined the contrary.* The Statute of Laborers, Edward III., says: "Because a great part of the people, and especially of workmen and servants, late died of the pestilence, many, seeing the necessity of masters and great scarcity of servants, will not serve unless they receive excessive wages." They were therefore to be compelled to serve, and they were to serve at the same wages which they had received three years before. The ratio of population, in consequence of the pestilence, had fallen considerably below the ratio of accumulated capital seeking to employ labor. Under the natural laws of demand and supply, the scarcity of laborers and the excess of capital would have raised the wages of labor. These laws were not to operate. Forty years after this enactment of Edward III., comes the statute of Richard II., which says that "Servants and laborers will not, nor by a long season would, serve and labor without outrageous and excessive hire, and much more than hath been given to such servants and laborers in any time past, so that for scarcity of the said servants and laborers the husbands and land-tenants may not pay their rents, nor scarcely live upon their lands." Here was a distinct conflict between the capitalists seeking profits and the laborers seeking wages. The law-makers resolved that the hires of the servants and laborers should be "put in certainty;" and they fixed the rate of wages throughout the land. They settled the contest in favor of profits, arbitrarily. To avoid this interference with the due payments of their labor in proportion to the ratio of capital and labor, the husbandmen might have fled to the towns, and some did so. But they were met there by the enactment that the artificers

* We have already noticed the ancient oppressive laws for the regulation of labor. We recur to them here more particularly, as illustrating the principle of wages.

should be subject to the same controlling power, and that the boy who had labored at the plow and cart till he was twelve years old should continue so to labor for the rest of his life. This state of things was truly slavery without the name. Some such marvelous folly and injustice went on for several centuries. But regulating wages, the laws also undertook to regulate the cost of food and of clothing—their quality, and their consumption—how much people should eat, and what coats they should wear. These absurdities also went on for centuries—of course under a perpetual system of open violation or secret evasion. The people, we may safely conclude, never fully believed what their rulers told them of their prodigious kindness in managing private affairs so much better than individuals could themselves. Mr. Sergeant Thorpe, an English judge for the northern circuit, in a charge to the grand jury in 1648, tells them to be vigilant against servants taking higher wages than those allowed by the justices—to enforce the laws against everybody who bought every thing for the sustenance of man, with intent to make a profit by it—against every tradesman who did not produce his wares in conformity with the statutes; wonderful laws, which would not permit the tanner to sell a piece of leather that had not been kept twelve months in the tan-pit, and which forbade the cloth-maker to use lime in whitening linen cloth. “And thus you see,” says solemn Mr. Sergeant Thorpe, “how the wisdom of the common laws of this nation, and of the parliaments, from time to time, hath provided for the security and ease of the people; and hath furnished us with a salve for every sore; and gives us rules and instructions how to govern ourselves, that we may be helpful and useful to one another.”* Instead of providing the salve, it probably would have been better not to have made the sore.

* See the full “Charge” in the “Harleian Miscellany.”

But, after all, it is scarcely candid to laugh at the wisdom of "the good old times" in regulating trades, when in our own day, we have had excise laws throughout Great Britain which interfered in the most absurd way with production, and some of which still interfere. Nor can we look with perfect complacency at the manifest impolicy and injustice of fixing the rate of wages, when, within the last quarter of a century, English justices have been at work all over the country to keep down the wages of labor, by paying laborers not in proportion to their earnings, but according to their necessities; and raising up a fund for the encouragement of idleness and improvidence, by a diversion of the real funds for the maintenance of labor. The Poor Laws of England, as they were administered in the beginning and middle of the last half century, did this evil, and a great deal more; and persons of influence, with the most benevolent intentions, could see no difference between the parish allowance to able-bodied laborers, and the wages which they could have really commanded for their labor if this opposing fund had not been called into action. In those times, and even after a strenuous effort had been made to bring about an improvement, educated gentlemen used to say, "something must be done to give the laborers employment upon fair wages;" and they were accustomed to believe that "some plan should be devised whereby work should be at hand."* These gentlemen, and many others, did not understand that there is a natural fund for the maintenance of labor which is to produce such beneficial results; that this fund can not be increased but by the addition of the results of *more* profitable labor; that whatever is paid out of the fund for the support of profitable labor has a direct tendency to lower the rate at which the profitable

* See the Evidence on Poor-laws before a Committee of the House of Commons, 1837.

labor is paid—to prevent the payment of “fair wages;” and that there is a “plan” which requires no devising, because our necessities are constantly calling it into operation—the natural law of exchange, which makes “work at hand” wherever there is capital to pay for it. Such reasoners also held that the laborers were not to seek for the fund “about the country on an uncertainty;” but that the work for the laborers “should be at hand”—“it should be certain.” This clearly was not the ordinary labor-fund. That is neither always at hand, nor is it always certain. It shifts its place according to its necessity for use; it is uncertain in its distribution in proportion to the demand upon it. The fund which was to work this good was clearly not the labor-fund—it was the *want*-fund; and the mistake that these gentlemen and many others fell into was that the want-fund had qualities of far greater powers of usefulness than the labor-fund; that the parish purse was the purse of Fortunatus, always full; that the parish labor-field was like the tent of the Indian queen in the Arabian tale—you could carry it in the palm of your hand, and yet it would give shelter to an army of thousands. All these fallacies are now, happily, as much exploded as the laws for the regulation of wages and the price of commodities. The real labor-fund—the accumulation of a portion of the results of past labor—is the only fund which can find profitable work and pay fair wages.

It is extremely difficult to ascertain the ratio of capital to population at any particular period; yet some approximations may be made, which, in a degree, may indicate the activity or the inertness of the labor-fund, in regard to the condition of the laborer.

According to the commonly received estimates, the population of England and Wales was about five millions and a half, perhaps six millions, at the end of the seventeenth cen-

tury; it is now eighteen millions. The inhabited houses, according to the hearth-books of 1690,* were one million three hundred and twenty thousand. In 1851 they were three million two hundred and seventy-eight thousand. The hearth-books of 1685 show that, of the houses of England, five hundred and fifty-four thousand had only one chimney—they were mere hovels.

Gregory King has given "A Scheme of the Income and Expense of the several Families in England, calculated for the year 1688." He considers that, in the aggregate, there were five hundred thousand families who were accumulators—that is to say, whose annual expense was less than their income. He values this accumulation at three millions. The number of persons comprised in the accumulating families was two million six hundred and seventy-five thousand. Of this number only one fifth belonged to the trading classes—merchants, shopkeepers and tradesmen, artisans and handicrafts. The remainder were the landholders, farmers, lawyers, clergy, holders of office, and persons in liberal arts and sciences. But there was a large non-accumulating class, consisting of two million eight hundred and twenty-five thousand, whom he puts down as "decreasing the wealth of the kingdom"—that is to say, that their annual expense exceeded their income; and this excess he computes at six hundred and twenty-two thousand pounds, which reduces the annual national accumulation to two million four hundred thousand pounds. The positive plunderers of the national capital were thirty thousand vagrants, such as gipsies, thieves, and beggars. But England was in a happier condition than Scotland at the same period; where, according to Fletcher of Saltoun, there were two

* Hearth-money was a tax upon houses according to the number of chimneys, at the rate of two shillings a chimney, for every house having more than two chimneys.

hundred thousand "people begging from door to door," out of a population of one million, for whose suppression he saw no remedy but slavery. England was more favored, too, than France; where, as Vauban records, in 1698, more than a tenth part of the population of sixteen millions were beggars, in the extremity of hunger and nakedness.* But we may be sure that in England the two million eight hundred and twenty-five thousand "laboring people, out-servants, cottagers, and paupers," who are put down by Gregory King as non-accumulators, were working upon very insufficient means, and that they were constantly pressing upon the fund for the maintenance of profitable labor. It is a curious fact that he classes "cottagers and paupers" together; but we can account for it when we consider how much of the land of the country was uninclosed, and how many persons derived a scanty subsistence from the commons, upon which they were "squatters," living in mean huts with "one chimney."

The small number of "artisans and handicrafts," comprising only sixty thousand families, is of itself a sufficient indication that English manufactures, properly so called, were of very trifling amount. In various parts of this volume we have incidentally mentioned how slowly the great industries of England grew into importance. At the period of which we are now speaking, nearly every article of clothing was, in many districts, of domestic production, and was essentially connected with the tillage of the land. The flax and the wool were spun at home; the stockings were knit; the shoes were often untanned hide nailed upon heavy clogs. Furniture there was little beyond the rough bench and the straw bed. The fuel came from the woods and hedges. About forty thousand of the cottages mentioned in the hearth-books had some land belonging to them; and, to

* See the passage in Dunoyer, "Liberté du Travail," tom. i., p. 416.

prevent the growth of a "squatter" population, it was the business of the grand jury to present, as a nuisance, all newly-erected cottages that had not four acres of land attached to them. There was a contest perpetually going on between the more favored portion who had regular means of subsistence, and the unhappy many who were pressing upon those means, in all the various forms of pauperism. One of the means of keeping down this class was to prevent them having dwellings.

Toward the end of the seventeenth century, then, we see that there was some accumulation of capital, however small. There was then a vague feeling among the accumulators that something might be saved by setting the unemployed and the starving to other work than was provided for them in the fields. Population was pressing hard upon capital. It pressed, chiefly, in the shape of increasing demands upon the poor-rate. The remedy universally proposed was "to set the poor to work." The notion was extremely crude as to the mode in which this was to be effected; but there was a sort of universal agreement expressed by sober economists as well as visionary projectors, that the more general introduction of manufactures would remedy the evil. Of course, the first thing to be done was to prohibit foreign manufactures by enormous duties; and then they were to go to work vigorously at home, knowing very little of the arts in which foreigners were greatly their superiors. But they were to go to work, not in the ordinary way of profitable industry, by the capitalist working for profit employing the laborer for wages, but by withholding from the poor the greater part of the want-fund, and converting it into a labor-fund, by setting up manufactures under the management of the poor-law administrators. Here, in these "work-houses," was the linen trade to be cultivated. A Mr. Firmin set up a work-house in London, of the results of which, after

four years, he thus speaks: "This, I am sure, is the worst that can be said of it, that it hath not been yet brought to bear its own charges." Sir Matthew Hale was for setting up a public manufactory of coarse cloth, of which the charges for materials and labor in producing thirty-two yards would be £11 15s. He calculated that the cloth, if sold, would only yield £12. The excellent judge does not make any calculation of the cost of implements, or rent, or superintendence. He desires to employ fifty-six poor people, who are paid by the parish £400 per annum, and by this cloth manufacture he will give them the £400 for their work, and save the parish their cost. One thing is forgotten. The pauper labor yielding no profit, and consequently preventing any accumulation, the laborers must be kept down to the minimum of subsistence. The earnings of the artisan and handicraft were estimated by Gregory King, at that period, at thirty-eight pounds per annum. These were the wages of skilled laborers. The pauper laborers were unskilled. If these schemes had not broken down by their own weight, and work-house manufactories had gone on producing a competition of unskilled laborers with skilled, the rate of wages would have been more and more deteriorated, and the amount of poor seeking work-house employment as a last resource more and more increased. Experience has very satisfactorily demonstrated that these schemes for employing the poor ought to be strictly limited to the production of articles of necessity for their own consumption. Even the production of such articles is scarcely remunerating—that is, the produce scarcely returns the cost of materials and superintendence. Even the boasted Free and Pauper Colonies of Holland have turned out to be commercial failures. They are not self-sustaining. The want of skill in the colonists, and their disinclination to labor, having no immediate individual benefit from their labors, have com-

bined to produce the result that one good day-laborer is worth five colonists working in common. There are also tenants of small colonial farms, at a low rent, and having many advantages. They are not so prosperous as the little farmers out of the colony, who pay a higher rent, and have no incidental benefits. The solution of the question is thus given: "The certainty that the society will maintain them, whether they save or not, has an unfavorable influence on their habits."*

The increase of population was very small in England during the first fifty years of the eighteenth century. It absolutely declined at one period. The £2,400,000 that were calculated by Gregory King as annual savings, were probably more and more trenched upon by pauperism and war, by "malice domestic, foreign levy," under a disputed succession. The upper classes were licentious and extravagant; the laborers in towns were drunkards to an excess that now seems hardly credible. Hogarth's "Gin Lane" was scarcely an exaggeration of the destitution and misery that attended this national vice. About the middle of the century, or soon after, sprang up many of the great mechanical improvements which made the English a manufacturing people; and which, in half a century, added a third to the population. In spite of the most expensive war in which England had ever been engaged, the accumulated capital, chiefly in consequence of these discoveries and improvements, had increased as fast as the population in the second fifty years of the eighteenth century. In the present century the population has doubled in fifty years, and the accumulated capital has more than doubled. Population has been recently increasing at the rate of one and a half per cent.; capital has been increasing at the rate of two

* Sir John M'Neill's "Report on Free and Pauper Colonies in Holland." 1853.

and a half per cent. It is this accumulation which has been steadily raising the rate of wages in many employments of industry; while the chemical and mechanical arts, the abundant means of rapid transit, the abolition or reduction of duties upon great articles of consumption, and the freedom of commercial intercourse, have given all the receivers of wages a greatly increased command of articles of necessity, and even of what used to be thought luxuries.

There is nothing more difficult in economical inquiries than the attempt to ascertain what was the actual rate of wages at any given period. The fluctuations in the value of money enter into this question, more or less, at every period of history. We find the nominal rate of wages constantly increasing, from one generation to another, but we can not at all be certain that the real rate is increasing. That nominal rate always requires to be compared with the prices of the necessities of life. What pertains to wages pertains to all fixed money-payments. A Fellow of an English college applied to Bishop Fleetwood to know if he could conscientiously hold his fellowship, when the statutes of the college, made in the time of Henry VI., say that no one shall so hold who has an estate of £5 a year. The Fellow had an estate of much larger nominal amount. The bishop made a very valuable collection of the prices of commodities, and he thus answers the conscientious inquirer :

"If for twenty years together (from 1440 to 1460) the common prices of wheat in England were 6s. 8d. the quarter; and if, from 1686 to 1706, the common prices of wheat were 40s. the quarter; 'tis plain that £5 in Henry VI. time would have purchased fifteen quarters of wheat, for which you must have paid, for these last twenty years, £30. So that £30 *now*, would be no more than equivalent to £5 in the reign of Henry VI. Thus if oats, from 1440 to 1460, were generally at 2s. the quarter, and from 1686 to 1706

were at 12*s.* the quarter, 'tis manifest that 12*s.* *now* would be no more than equivalent to 2*s.* *then*, which is but a sixth part of it. Thus, if beans were *then* 5*s.* and *now* 30*s.* the quarter, the same proportion would be found betwixt £5 and £30. But you must not expect that every thing will answer thus exactly. Ale, for instance, was, during the time of your founder, at three halfpence the gallon; but it has been, ever since you were born, at 8*d.* at the least—which is but five times more, and a little over. So that £5 heretofore (between 1440 and 1460) would purchase no more ale than somewhat above £25 would *now*. Again, good cloth, such as was to serve the best doctor in your university for his gown, was (between 1440 and 1460) at 3*s.* 7*d.* the yard; at which rate £5 would have purchased twenty-nine yards, or thereabouts. *Now* you may purchase that quantity of fine cloth at somewhat less, I think, than £25. So that £25 *now* would be an equivalent to your £5 *then*, two hundred and fifty years since, if you pay about 18*s.* the yard for your cloth. I think I have good reason to believe that beef, mutton, bacon, and other common provisions of life, were six times as cheap in Henry VI. reign as they have been for these last twenty years. And, therefore, I can see no cause why £28 or £30 per annum should now be accounted a greater estate than £5 was heretofore betwixt 1440 and 1460.”*

But we are not to infer from these considerations that the wages of labor ought to fluctuate with the price of commodities, or that, practically, they do so fluctuate. If this were the principle of wages, every improvement which lowers the price of commodities would lower the rewards of labor. Almost every article of necessity is cheaper now than it was ten years ago, taking the average of years; and the larger amount of this cheapness has been produced by

* *Chronicon Preciosum*, 1745, p. 136.

improvements in manufactures, by facilities of communication, and by the removal of taxation. At the same time, taking the average of years and of employments, wages have risen. There must be some general cause in operation to produce this result.

The wages of labor can not be reduced below the standard necessary to support the laborer and his family while he produces. If he can not obtain this support he ceases to be a producer. He is starved out of existence, or he falls upon the public fund for the support of want, or he becomes a beggar or a thief. In states of society where there is no accumulating capital, the laborer necessarily receives low wages, because he maintains himself at the minimum of subsistence. The poet Spenser, writing nearly three centuries ago, upon the miseries of Ireland, describes the cottiers as inhabiting "swine-sties rather than houses." Swift, long after, describes the same state of things: "There are thousands of poor wretches who think themselves blessed if they can obtain a hut worse than the squire's dog-kennel, and an acre of ground for a potato plantation." This condition of society unhappily lasted up to our own day. If the Irish cottier had been a laborer for wages instead of deriving his miserable living direct from the land, he would have been no better off, unless his desire for something higher than the coarsest food, and the most wretched lodging, had set some limit to the increase of population beyond the increase of capital. Population necessarily increases faster than subsistence when there is no restraint upon the increase by the disposition to accumulate on the part of the laborer. There may be accumulation in the form of his money-savings; and there may be accumulation in an increase of the conveniences of life by which he is surrounded. When there is neither money saved nor comforts increased—when there is no accumulation for the gratification of other wants than

that of food—competition is driving the laborers to the lowest point of misery. The competition in Ireland was for the possession of land, at an extravagant rent, out of the labor upon which the cottier could only obtain the very lowest amount of necessaries for his subsistence. If, in the habits of the whole body of the peasantry, clothes and furniture had been as necessary as potatoes, the oppressive exactions of the landlords must have yielded to what then would have been the natural rate, whether we call it profit or wages, necessary for the maintenance of that peasantry; and the necessity, on their part, for maintaining the average *status* of their class, would, in a considerable degree, have kept down the inordinate increase of the people. A century ago, the great body of the working people of England eat rye bread, which is cheaper than wheaten. If all the workers were to come back to rye bread, the rate at which they could be comfortably maintained would be somewhat less; and unless the accumulation from the economy were expended universally in some improved accommodation, laborers would gradually arise who would be contented with the smaller amount necessary for subsistence, and the greater number of laborers seeking for wages would depress the amount paid to each individual laborer.

In looking back upon the historical evidence which we possess, imperfect as it is, of the condition of society at various periods of English industrial progress, we can not doubt that there has been a process constantly going forward by which the circumstances of all classes have been steadily raised. The increase of the means of the various classes at the present day as compared with the end of the seventeenth century, has certainly been threefold. We have abundance of conveniences and comforts of which the people who lived one hundred and fifty years ago had no

notion, which have been bestowed upon us by manufactures, and commerce, and scientific agriculture.

We have already stated and illustrated the general principle that the wages of labor are determined by the accumulations of capital, compared with the number of laborers. Hence it necessarily results that, as has been forcibly expressed, "the additional capital, whenever it is productively employed, will tend as certainly to the benefit of the working population at large as if the owner were a trustee for their benefit."* But the profitable employment of capital depends very greatly upon activity, knowledge, and foresight on the part of the capitalist. It was for the want of these qualities that all the old schemes for providing labor out of a common stock chiefly broke down. Sir Matthew Hale, in his plans for employing paupers in spinning flax and weaving cloth, knew theoretically the truth that the amount of capital available for the payment of labor would be largely increased by the rapidity with which it might be turned over. He says, "If it could be supposed that the cloth could be sold as soon as made—which is not, I confess, reasonably to be expected—then a stock of £24 would, by its continual return, provide materials and pay the workmen for one loom's work in perpetuity." The "if" expresses the difference between individual commercial activity and knowledge, and official sluggishness and incapacity. But it also expresses the difference between the commerce of our days, and that of the end of the seventeenth century. Without roads, or canals, or railroads, how difficult was it to bring the seller and the buyer together! All manufactures would be, for the most part, local. The cloths of the manufacturer might go to the neighboring fairs on pack-horses; and thence slowly spread through the country by peddlers and other small dealers;

* Morison, "Labor and Capital," p. 24.

and the proceeds might return to the manufacturer at the end of a year. But the rapid turning over of capital which begins with buying a bale of cotton at New York, and having it in California in the shape of calico in three months, with the bill that is to pay for it drawn at Boston, accepted in San Francisco, and discounted in New York in another three months, is a turning over of capital which was scarcely imagined by the projectors and practical traders of a century ago.

This rapid turning over of capital, and the consequent more rapid accumulation of the labor-fund, depends upon the confidence of the capitalist that his capital will work to a profit. It will not so work if he is to be undersold. If wages could press upon profit beyond a certain ascertained limit, he would be undersold. The home competition of localities and individuals is perpetually forcing on the most economical arrangements in production. The foreign competition is doing so still more. If we have increased productiveness here, through scientific application, the same increased productiveness, from the same cause, is going forward elsewhere. "Price-Currents" supply a perpetual barometer of industrial cloud or sunshine; and the manufacturer and merchant have constantly to unfurl or furl their sails according to the indications. Whenever there is shipwreck, the ship's crew and the captain partake of a common calamity; and the calamity is always precipitated and made more onerous when, from any cause, there is not cordial sympathy and agreement.

CHAPTER XXVII.

WEST POLITICAL ECONOMY TEACHERS.—SKILLED LABOR AND TRUSTED LABOR.—
COMPETITION OF UNSKILLED LABOR.—COMPETITION OF UNCAPITALED LABOR.—
ITINERANT TRADERS.—THE CONTRAST OF ORGANIZED INDUSTRY.—FACTORY-LABOR
AND GARENTRY-LABOR.—COMMUNISM.—PROPOSALS FOR STATE ORGANIZATION OF
LABOR.—SOCIAL PUBLISHING ESTABLISHMENT.—PRACTICAL CO-OPERATION.—DUTIES
OF THE EMPLOYED.—DUTIES OF EMPLOYERS.—CONCLUSION.

THERE is a passage in Wordsworth's "Excursion" in which he describes the benevolent and philosophical hero of his poem, a peddler, listening to the complaints of poverty, and searching into the causes of the evil:

"Nor was he loth to enter ragged huts,
Huts where his charity was blest; his voice
Heard as the voice of an experienced friend.
And, sometimes, where the poor man held dispute
With his own mind, unable to subdue
Impatience, through inaptness to perceive
General distress in his particular lot;
Or cherishing resentment, or in vain
Struggling against it, with a soul perplex'd
And finding in herself no steady power
To draw the line of comfort that divides
Calamity, the chastisement of Heaven,
From the injustice of our brother men;
To him appeal was made as to a judge;
Who, with an understanding heart, allay'd
The perturbation; listen'd to the plea;
Resolv'd the dubious point; and sentence gave
So grounded, so applied, that it was heard
With soften'd spirit—e'en when it condemn'd."

The poor man is accustomed to hold dispute with his own mind; he thinks his particular lot is worse than the general lot; his soul is perplexed in considering whether his condition is produced by a common law of society, or by the injustice of his fellow-men; the experienced friend listens, discusses, argues—but he argues in a temper that produces a softened spirit. The adviser soothes rather than inflames, by dealing with such questions with “an understanding heart.” He unites the sympathizing heart with the reasoning understanding.

Now, we may fairly inquire if, during the many unfortunate occasions that are constantly arising of contests for what are called the rights of labor against what is called the tyranny of capital, those who are the most immediate sufferers in the contest are addressed with the “understanding heart?” If argument be used at all, the principles which govern the relations between capital and labor are put too often dictatorially or patronizingly before them, as dry, abstract propositions. They are not set forth as matters of calm inquiry, whose truths, when dispassionately examined, may be found to lead to the conclusion that a steadily-increasing rate of wages, affording the employed a greater amount of comforts and conveniences, is the inevitable result of increasing capital, under conditions which depend upon the workers themselves. The result is generally such as took place in a recent English strike, where one of the leaders exclaimed, “The sooner we can rout political economy from the world, the better it will be for the working-classes.” It might, indeed, as well be said, the sooner we can rout acoustics from the world, the better it will be for those who have ears to hear; but the absurdity would not be corrected by a mathematical demonstration to those who did not comprehend mathematics. The same person held that political economy was incompatible with the

Gospel precept of doing unto others as we would be done unto, because it encourages buying in the cheapest market and selling in the dearest; and he necessarily assumed that political economy recommends the capitalist to buy labor cheap and sell it dear. We have not learned that calmly and kindly he was told, in the real spirit of political economy, that it is impossible that, by any individual or local advantage the capitalist may possess, he can long depress wages below the rate of the whole country, because other capitalists would enter into competition for the employment of labor, and raise the average rate. If Wordsworth's experienced friend had heard this perversion of the meaning of the axiom about markets, he would have said, we think, that to buy in the cheapest market and sell in the dearest simply means, in commerce, to buy an article where its cheapness represents abundance, and to sell it in a place where its dearness represents a want of it and a consequent demand—even as he, the peddler, bought a piece of cloth where there was plenty of cloth, and sold it for a profit where there was little cloth. The business of mercantile knowledge and enterprise is to discover and apply these conditions; so that, if a trader were to buy hides in New York and carry them to Buenos Ayres, he would reverse these conditions—he would buy in the dearest market and sell in the cheapest. Political economy—the declaimer against it might have been told—says that to produce cheap is essential to large demand, and constantly-increasing demand; but it does not say that cheap production necessarily implies diminished wages. It says that cheap production, as a consequence of increased production, depends upon the constantly-increasing use of capital in production, and the constantly-diminishing amount of mere manual labor compared with the quantity produced—which result is effected by the successive application of all the ap-

pliances of science to the means of production. At every step of scientific improvement there is a demand for labor of a higher character than existed without the science. At every extended organization of industry, resulting from an extended demand, not only skilled labor, but trusted labor, becomes more and more in request; and the average amount of all labor is better paid. A bricklayer is paid more than the man who mixes his mortar, because one is a skilled laborer, and has learned his art by some expenditure of time, which is capital. The merchant's book-keeper is paid more than his porter, because the one has an office of high trust and responsibility, and the other a duty to perform of less importance, and for which a far greater number of men wanting hire are fitted. We could wish that not only "in ragged huts," but in well-appointed houses, were the things better understood that political economy really does say.

The process which has been steadily going on among us for increasing the demand for skill and trustworthiness has no doubt produced a diminution of the funds for employ in which neither skill nor trust is required. Thus a great amount of suffering is constantly presented to our view, which benevolence has set about relieving, in our time, with a zeal which shows how fully it is acknowledged that the great principle, to "Love one another," is not to evaporate in sentiment, but is to be ripened in action. As nations, England and America have never been indifferent to the command, "Feed the hungry." But the "understanding heart" has discovered that many of the miseries of society may be relieved by other modes as effectually as by alms-giving, and perhaps much more effectually. Whether some of these efforts may be misdirected, in no degree detracts from the value of the principle which seeks the prevention of misery rather than the relief. One of the most obvious forms in which misery has presented itself in our

large cities has arisen from the competition among labor which may be called unskilled, because there are a numerous unemployed body of laborers at hand to do the same work, in which there is no special skill. This was the case with the sempstresses of London; and the famous "Song of the Shirt" struck a note to which there was a responding chord in every bosom. But the terrible evils of the low wages of shirt-making would not have been relieved by a universal agreement of the community to purchase none but shirts that, by their price, could afford to give higher wages to the shirt-makers. The higher wages would have infallibly attracted more women and more children to the business of shirt-making. The straw-platters, the embroiderers, the milliners would have rushed to shirt-making; and, unless there had been a constantly-increasing rate of price charged to the wearers of shirts, and therefore a constant forced contribution to the capital devoted to shirt-making, the payment to one shirt-maker would have come to be divided among two; and the whole body, thus doubled by a rate of wages disproportioned to the rate of other labor requiring little peculiar skill, would have been in a worse condition in the end than in the beginning.

Whatever suffering may arise out of the competition that must exist between mere manual labor, and also between that labor which is displayed in the practice of some art easily learned, capable of exercise by both sexes, and in which very young children may readily engage—it is scarcely fair that those who witness the suffering of the employed at very low wages should instantly conclude that the employers are extortioners and oppressors. A branch of trade which seems inconsiderable as regards the article produced is often found in a particular locality, and furnishes employment to large numbers. In the London parish of Cripplegate there are great quantities of tooth-brushes

made. The handle is formed by the lathe, in which skilled labor is employed. The hair is cut by machinery. The holes in the handle in which the hair is inserted are also pierced by machines. But the insertion of the hair, and the fastening it by wire, are done by hand. Excellent people, who, with a strong sense of Christian duty, enter "ragged huts" to relieve and to advise, see a number of women and children daily laboring at the one task of fastening the hair in tooth-brushes; and they learn that the wages paid are miserably low. They immediately conclude that the wages should be higher; because in the difference between the retail price of a tooth-brush and the manufacturing cost there must necessarily be large profits. They say, therefore, that the wholesale manufacturer is unjust in not giving higher wages. But the retail price of tooth-brushes, however high, does not enable the manufacturer, necessarily, to give a payment more considerable than the average of such labor to the women and children who very quickly learn the art of fastening the hair. The price he can pay is to be measured by the average price of such labor all over the country. It is not in the least unlikely that the manufacturer in Cripplegate may not receive a fourth of the price at which a tooth-brush is sold. The profits are determined by the average of all his transactions. He has to sell as cheaply as possible for the export trade. If he sell dear, the export-trader will see if he can not buy a hundred thousand tooth-brushes in France instead of England. It is nothing to the exporter whether he obtain a profit out of French or English tooth-brushes. Again. The manufacturer sends a hundred thousand tooth-brushes to a wholesale dealer at New York, who supplies the retailers throughout the United States. But before the New York merchant will repeat the order, he will ascertain whether he can buy the article cheaper at Birmingham; and one per cent. lower

will decide against Cripplegate. Now, in all these domestic labors involving small skill, the question is, whether the miserably-paid workers can do any thing more profitable. Mr. Mayhew says that some large classes "do not obtain a fair living price for their work, because, as in the case of the needle-workers and other domestic manufacturers, their livelihood is supposed to be provided for them by the husband or father; and hence the remuneration is viewed rather as an aid to the family income than as an absolute means of support." It is not what is "supposed," or what is "viewed," that determines the question. It is what really is. Such employ may, unhappily, be sought by many as "an absolute means of support." But if there be an almost unlimited number who seek it as "an aid to the family income," there is no possibility of preventing a competition, perfectly equal as regards the wages of labor, but wretchedly unequal in the application of those wages.

The miseries that are so frequently resulting from the competition of unskilled labor are also results from what we will venture to call uncapitalized labor, attempting to unite wages with profits. Upon a large scale, the miseries of Ireland, which finally collapsed in the terrible famine, were produced by labor trenching upon the functions of capital without possessing capital. In 1847 there were in Ireland 500,000 acres of land in more than 300,000 tenancies, thus supplying the only means of maintenance to 300,000 male laborers and their families, but averaging little more than an acre and a half to each tenant. There are not more than 900,000 laborers and farmers to the 25,000,000 cultivated acres in England and Wales—about one laborer to thirty-eight acres, and about one farmer capitalist to every hundred and ten acres. Nor is the effect of uncapitalized and unskilled labor—for uncapitalized labor is for the most part *unskilled*—less remarkable in manufactures than in agricul-

ture. Many are familiar with the minute details of low wages and suffering—of the oppressions attributed to masters and middle men—which are contained in a series of papers by Mr. Henry Mayhew, published in "*The Morning Chronicle*" in 1849-50, under the title of "London Labor, and London Poor." Nothing could be more laudable than the general object of these papers, which, in the preface to a collected edition of a portion of them, was "to give the rich a more intimate knowledge of the sufferings, and the frequent heroism under these sufferings, of the poor;" and to cause those "of whom much is expected, to bestir themselves to improve their condition." But, at the same time, it would be difficult to say how the condition of particular classes of these sufferers was to be improved, except by such general efforts as would raise up the whole body of the people in knowledge and virtue, and by directing the labors of those who, without skill or capital, were struggling against skill and capital, into courses of industry more consonant with the great modes of productiveness all around them. One example may illustrate our meaning—that of "the garret-masters of the cabinet-trade." The writer we have mentioned says that wages in London had fallen 400 per cent. in that trade, between 1831 and 1850; but he also says that the trade was "depressed by the increase of small masters—that is to say, by a class of workmen possessed of just sufficient capital to buy their own materials, and to support themselves while making them up." Taking the whole rate of wages—the payment to the unskilled as well as the skilled workmen—it would be difficult not to believe that the average reduction was quite as great as represented. A cabinet-maker tells this tale:

"One of the inducements," he said, "for men to take to making up for themselves is to get a living when thrown out of work until they can hear of something better. If

they could get into regular journeywork there a'n't one man as would n't prefer it—it would pay them a deal better. Another of the reasons for the men turning small masters is the little capital that it requires for them to start themselves. If a man has got his tools he can begin as a masterman with a couple of shillings. If he goes in for making large tables, then from 30*s.* to 35*s.* will do him, and it's the small bit of money it takes to start with in our line that brings many into the trade who would n't be there if more tin was wanted to begin upon. Many works for themselves, because nobody else won't employ them, their work is so bad. Many weavers has took to our business of late. That's quite common now—their own's so bad; and some that used to hawk hearthstones about is turned table-makers." Whether the mode in which this workman expresses himself correctly indicates, or not, the amount of his education, it is quite certain that he had got to the root of the evil of which he complains.

The competition that is only limited by the capacity of endurance between the unskilled workman and the uncapi-
taled workman—each striving against the other, and striving in vain against capital and skill—has been going on for centuries in the distribution of commodities. The retailer with small capital has always had to carry on an unequal contest with the retailer with large capital. In our time, many small shops are swallowed up in magnificent warehouses, in which every article of dress especially can be purchased under one roof—from a penny yard of ribbon to a five hundred-dollar shawl. In splendor these bazaars, with one proprietor, rival the oriental with many competitors. But their distinguishing characteristic is the far-seeing organization, by which the capital is turned over with unexampled rapidity, and no unsaleable stock is kept on hand. It is easy to understand that the larger profits of the small re-

tailer have very little chance of accumulation against the smaller profits of the large retailer.

But this contest of small capital against large was formerly carried on in the struggle of the itinerant traders against the shopkeepers. It is now carried on in a struggle among themselves. The census returns of London show seven thousand costermongers, hucksters, and general-dealers. Mr. Mayhew says there are ten thousand in London.

The costermonger is a traveling shopkeeper. We encounter him not in the great business thoroughfares; in the neighborhood of the great markets and well-stored shops he travels not. But his voice is heard in some silent streets stretching into the suburbs; and there his donkey-cart stands at the door, as the dingy servant-maid cheapens a lot of vegetables. He has monopolized all the trades that were anciently represented by such "London cries" as "*Buy my artichokes, mistress;*" "*Ripe cucumbers;*" "*White onions, white St. Thomas' onions;*" "*White radish;*" "*Ripe young beans;*" "*Any baking pears;*" "*Ripe speragas.*" He would be indignant to encounter such petty chapmen interfering with his wholesale operations. Mr. Mayhew says that "the regular or thoroughbred costermongers repudiate the numerous persons who only sell nuts or oranges in the streets." No doubt they rail against these inferior competitors, as the city shopkeepers of the sixteenth and seventeenth centuries railed against itinerant traders of every denomination. In the days of Elizabeth, they declare by act of common council, that in ancient times the open streets and lanes of the city have been used, and ought to be used, as the common highway only, and not for hucksters, pedlers, and hagglers, to stand and sit to sell their wares in, and to pass from street to street hawking and offering their wares. In the seventh year of Charles I., the

same authorities denounce the oyster-wives, herb-wives, tripe-wives, and the like, as "unruly people;" and they charge them, somewhat unjustly as it must appear, with "framing to themselves a way whereby to live a more easy life than by labor."

"How busy is the man the world calls idle!"

The evil, as the citizens term it, seems to have increased; for in 1694 the common council of London threatened the peddlers and petty chapmen with the terrors of the laws against rogues and sturdy beggars, the least penalty being whipping, whether for male or female. The reason for this terrible denunciation is very candidly put: the citizens and shopkeepers are greatly hindered and prejudiced in their trades by the hawkers and peddlers. Such denunciations as these had little share in putting down the itinerant traders. They continued to flourish, because society required them; and they vanished from our view when society required them no longer. In the middle of the last century they were fairly established as rivals to the shopkeepers. Dr. Johnson, than whom no man knew London better, thus writes in the "*Adventurer*:" "The attention of a new-comer is generally first struck by the multiplicity of cries that stun him in the streets, and the variety of merchandise and manufactures which the shopkeepers expose on every hand." The shopkeepers have now ruined the itinerants—not by putting them down by fiery penalties, but by the competition among themselves to have every article at hand, for every man's use, which shall be better and cheaper than the wares of the itinerant.

A curious parallel might be carried out between the itinerant occupations which the progress of society has imperfectly suspended, and those which even the most advanced civilization is compelled to retain. For example

—the water-carrier is gone. But the cry of "*Milk*," or the rattle of the milk-cart, will never cease to be heard in our streets. There can be no reservoirs of milk, no pipes through which it flows into the houses. The more extensive the great capital becomes, the more active must be the individual exertion to carry about this article of food. The old London cry was, "*Any milk here?*" and it was sometimes mingled with the sound of "*Fresh cheese and cream*;" and it then passed into "*Milk, maids, below*;" and it was then shortened into "*Milk below*;" and was finally corrupted into "*Mio*," which some wag interpreted into *mi-eau*—*demi-eau*—half-water. But it must still be cried, whatever be the cry. The supply of milk to New York or London is perhaps one of the most beautiful combinations of industry we have. The days are long past since green pastures were to be found within the city's limits. Slowly, but surely, does the baked clay stride over the clover and the buttercup; and yet every family in New York may be supplied with milk by eight o'clock every morning at their own doors. Where do the cows abide? They are congregated in wondrous masses in the suburbs; and though in spring-time they may, perchance, go out to pasture in the fields and there crop the tender blade,

"When proud pied April, dressed in all his trim,
Hath put a spirit of youth in every thing,"

yet for the rest of the year the coarse grass is carted to their stalls, or they devour what the breweries and distilleries can not extract from the grain harvest. Long before "the unfolding star wakes up the shepherd" are the New York cows milked; and the great wholesale venders of the commodity bear it in carts to every part of the town, and distribute it to hundreds of itinerants, who are waiting like the water-carriers at the old conduits. But the wholesale

venders have ceased to depend upon the suburban cows. The rail-ways bring milk in enormous cans to every station. The suburb has extended, practically, to a circle of fifty miles instead of five. It is evident that a perishable commodity, which every one requires at a given hour, must be rapidly distributed. The distribution has lost its romance. Misson, in his "Travels in England," published at the beginning of the last century, tells us of the May-games of "the pretty young English country girls that serve the town with milk." Alas! the May-games, and pretty young country girls have both departed, and a milkwoman has become a very unpoetical personage. There are few, indeed, of milkwomen who remain. The cry of "*Water-cresses*" used to be heard in London from some barefoot nymph of the brook, who at sunrise had dipped her feet into the bubbling runnel, to carry the green luxury to the citizens' breakfast-tables. Water-cresses are now grown like cabbages in gardens.

The history of "cries" is a history of social changes. The *working* trades, as well as the venders of things that can be bought in every street, are now banished from our thoroughfares. "*Old chairs to mend*" still salutes us in some retired suburb; and we still see the knife-grinder's wheel; but who vociferates "*Any work for John Cooper?*" or "*A brass pot or an iron pot to mend?*" The trades are gone to those who pay scot and lot.

There are some occupations of the streets, however, which remain essentially the same, though the form be somewhat varied. The sellers of food are of course among these.

If we lament over the general decay of the itinerant traders—their uncertain gains, their privations from constant exposure, their want of home comforts, their temptation to drive their children into the streets to make more

sales—we lament over what is an inevitable consequence of the general progress of society. Can we correct these evils by saying that the profits of the itinerant traders ought to be raised? Their low condition is a necessary consequence of their carrying on a system of industry which is at variance with the general system of civilization. They may have their uses in districts with a scattered population, because they bring articles of consumption to the door of the consumer. But in densely populated districts they must inevitably be superseded by the shopkeepers. They carry on their industry by a series of individual efforts, which are interfered with by numerous chances and accidents. We are told that the class is extending yearly in England. But it can not extend profitably. In many cases it assumes only another form of mendicity. It is a precarious occupation. It can count upon no regular returns. Its gains, such as they are, are like all other uncertain gains—the impulse to occasional profligacy in connection with habitual misery. The costermongers of London, according to Mr. Mayhew, are drunkards and gamblers, living without religion or the family ties. Their children are wholly uneducated. These are brought up to assist very early in obtaining their precarious living, and they cleave to a wandering in place of a settled life. Dissociated thus from all regular industry, they become the outcasts of the people, and go on swelling the number of those who, in France, are called “the dangerous classes.” All classes are dangerous in whom there is none of that self-respect which goes along with domestic comfort—with sobriety, with cleanliness, with a taste for some pursuit that has a tincture of the intellectual. How is such a class to be dealt with? The adult are almost past hope; the young, taken early enough, may be trained into something better. But the very last thing that society has to do is to encourage, by any forced and unnatural process,

the accession of numbers to the body, always deriving new competitors from the unfortunate and the idle who have fallen out of regular occupation.

In striking contrast to the various forms of unskilled labor and irregular trading which we have noticed, may be mentioned an industry which in London has a very perfect organization. In a single district there are sixteen hundred watchmakers. These are not the artisans whom we see as we pass along the streets of the metropolis, and of the country towns, sitting in front of the shop-window diligently repairing or putting together the works of a watch, by the light of day or of a brilliant lamp, each with a magnifying glass pressed under his eyebrow. Nor are they the workers in metal who manufacture the movements—that is, the wheels—of a watch. The London watchmakers, thus closely packed in a district which is small compared with the whole area of the metropolis, are those who put the movements together, and supply all the delicate parts of the mechanism, such as the spring and the escapement. They provide also the case and the dial-plate. The degree of the skilled labor employed in these several branches necessarily varies, according to the quality of the instrument to be produced, from the ordinary metal watch to the most luxurious repeater. With some exceptions, the artisans do not work in large factories. They are subdivided according to their respective qualities, among small establishments, where a master has several men receiving wages for performing one particular branch of work; or the artisan himself, in his own home, may be an escapement-maker, a spring-maker, a fusee-maker, a maker of hands, an enameller, an engine-turner, a jewelled pivot-hole maker. All this beautiful subdivision of employments has been found necessary for the perfection and the cheapness of watches. The capitalist, who is essentially the watch

manufacturer, organizes all these departments of industry. English watches, by this economical system of production, have kept their place against the competition of foreign watches; of which were imported, in 1853, into Great Britain, fifty-four thousand. The skilled workmen, in all the various subdivisions of the manufacture, are well paid, and take their due rank among the great and increasing body of intelligent mechanics.

Within the last few years American clocks have been extensively sold in England. People would once have thought that the business of clockmaking in England would be at an end, if it had been predicted that in 1853 she would import, as she did, a hundred and forty thousand clocks. The goodness and cheapness of American clocks have carried a clock into many a house, that without them would have been deficient of this instrument for keeping all industry in accordance with the extraordinary punctuality which has been forced upon us as an indispensable quality. We owe the general exercise of this virtue to the post and the railroads. No one needs now to be told, as our grandfathers were somewhat roughly told by the inscription often carved on a sun-dial, "Be gone about thy business." The American clocks are produced by factory-labor. In Connecticut two hundred and fifty men are employed in one establishment, in making six hundred clocks a-day, the price varying from one dollar to ten, and the average price being three dollars. Each clock passes through sixty different hands; but in every stage the most scientific applications of machinery chiefly produce the excellence and the cheapness.

Between the factory-labor required to produce a Connecticut clock, which labor affords ample wages to every laborer employed, and ample security to the capitalist that he will not establish expensive machinery, and pay constant

wages, without profit—between this factory-labor, and the “garret-labor” which produces a rickety table, with bad materials and imperfect tools, at the lowest rate of profit to the workman, the difference really consists in the application or non-application of capital. The theorist then steps in at this stage of the evidence, and says that the garret-laborer ought to be provided with capital. His theory resolves itself into what is called Communism; and it seeks to be maintained by exhibiting the aggregate evils of Competition. The theorist does not deny that competition has produced an immense development of wealth; but he affirms that the result of the struggle has been to fill the hands that are already too full, and to take away from the hands that are already nearly empty. He maintains that the laboring classes have been more and more declining with every increase of the general riches; and that, at every step in which industry advances, the proportion of the wretched to the great mass of the population as certainly increases. We shall not attempt to reply to these declamations by any counter declamation. We point to the great body of facts contained in this volume; and upon them rests our unqualified assertion that the doctrines of Communism are wholly untrue, and are opposed to the whole body of evidence that enables us to judge of the average condition of the people, past and present.

To remedy the evils which it alleges to exist, Communism proposes associations working upon a common capital, and dividing the produce of all the labor of the community. To make a whole country labor in this way, by a confiscation of all the capital of the country, presents, necessarily, great difficulties; and therefore there must be smaller communities in particular localities. But these communities must produce every thing within themselves, or they must deal with other communities. There would be competition

in these communistic dealings between one community and another. Even if the whole world were to become communistic, there would be competition between one nation and another nation.

The main objection to the theory of Communism (the objections to its application are obvious enough) is that, in proposing to have a common fund for all labor, it wars against the natural principle of individuality, and destroys the efficiency of production, by confounding the distinctions between the various degrees of skill and industry. If it give higher rewards to skilled labor than to unskilled, it does exactly what is done in the present state of society. If the unskilled and idle were the larger number under a system of Communism, they would soon degrade the skilled and the industrious to their own level. If they were the less powerful number, the skilled and the industrious would soon bring back the law of competition, and drive the unskilled and idle to the minimum point of subsistence.

But Communism, to meet such difficulties, sets up a system of expedients. It invokes the aid of the State as a regulating power; and, having maintained that the State is bound to find employ for every one willing to labor, however inefficiently, and to supply the necessary funds for all labor, it makes the State the great healer of differences, even as Mr. Sergeant Thorpe held that the State could provide "a salve for every sore." Let us take one example of the mode in which Communism proposes to discharge its functions.

There is a little treatise, in Italian, by Count Pecchio, on the Application of the General Laws of Production to Literary and Scientific Publications. It considers that literary labor is governed by the same laws as any other labor; that the capital of a man of letters consists in his stores of

acquired knowledge; that, as there is no equality in literary talent—as there is a great range of talent between the most skilled and the least skilled literary laborer—so the rewards of literary industry are proportionally unequal; that the wages of literary labor depend upon the usual conditions of demand and supply; that, under a system of competition in an open market, the literary laborer is more sure of his reward, however large may be the number of laborers, than in the old days of patronage for the few; that State encouragement is not necessary to the establishment of a high and enduring literature; that when literary industry is free—when it is neither fostered by bounties, nor cramped and annihilated by prohibitions—when there is neither patronage nor censorship—it is in the most favorable condition for its prosperous development. These principles, applied to literary production, are in many respects applicable to all production.

Every one has heard of the “Organization of Labor,” which some philosophers of France attempted to transfer from the theories of the closet to the experiments of the workshop, in 1848. It is not our object, as we have said, to discuss whether a vast system of national co-operation for universal production be a wise thing or a practical thing. Let us state only a small part of that system, as exhibited in the “*Organisation du Travail*,” by Monsieur Louis Blanc, the second part of which is devoted to the question of literary property.

All the beneficial results contemplated by the organizers of a universal social industry are to be obtained for literary industry, according to this system, by the foundation of a Social Publishing Establishment, which is thus described: It would be a literary manufacture belonging to the State without being subject to the State. This institution would govern itself, and divide among its members the profits

obtained by the common labor. According to its original laws, which would be laid down by the State, the Social Publishing Establishment would not have to purchase any author's right in his works. The price of books would be determined by the State, with a view to the utmost possible cheapness; all the expenses of the impression would be at the charge of the Social Establishment. A committee of enlightened men, chosen and remunerated by the Social Establishment, would receive the works. The writers whose works the Social Establishment would publish would acquire, in exchange for their rights as authors, which they would wholly resign, the right of exclusively competing for national recompenses. There would be, in the annual national budget, a fund provided for such recompense, for authors in every sphere of thought. Every time the first work of an author was deemed worthy of a national recompense, a premium would also be given to the Social Establishment, that it might be indemnified for the possible loss which it had sustained in giving its support to youthful talent. Every year the representatives of the people would name for every branch of intellectual exertion, a citizen who would examine the works issuing from the social presses. He would have a whole year to examine them thoroughly; to read all the criticisms upon them; to study the influence which they had produced upon society; to interrogate public opinion through its organs, and not judge by the blind multitude of buyers; and, finally, to prepare a report. The national rewards would then be distributed in the most solemn manner.

We thus state briefly, but fairly, the plan which is to put an end to that literary competition which it is proclaimed "commences in dishonor and ends in misery;" which is to destroy bad books and encourage good; which, it is affirmed, is "no longer to make the publication of good books

depend upon the speculators, who have rarely any other intelligence than a commercial aptitude, but upon competent men, whom it interests in the success of every useful and commendable work." We truly believe that this would be a practicable plan—provided two conditions were secured, which at present seem to be left out of the account. They are simply these—that there should be unlimited funds at hand for the purpose of rewarding authors, and unlimited wisdom and honesty in their administrators. But unhappily, as we understand it, the entire plan is a confusion of principle—rejecting much that is valuable in competition, and adopting much that is positively harmful in co-operation. Those authors who are profiting largely by the competitive system are to give up their profits to the common fund, which is to support those who could not make profits under that system. This is the social workshop notion of equality. But in the literary workshop the State is to step in and restore the ancient condition of inequality, by exclusive rewards to the most deserving of the competitors. It is a practical satire upon the whole scheme of a new social arrangement.

With a sincere disposition to speak favorably of every plan for promoting the welfare of our fellow-creatures, which is not founded upon a destruction of the security of property, we have no desire to maintain that all the denouncers of competition are weak and dangerous advisers of the great body of working people. We believe that the entire system of any proposed co-operation that would set aside competition is a delusion—out of which, indeed, some small good might be slowly and painfully evoked, but which can never mainly affect the great workings of individual industry, while its futile attempts may relax the springs of all just and honest action. But we do not in any degree seek to oppose any practical form of co-operation that is built upon

the natural and inevitable workings of capital, tending to produce in a manner not less favorable for production than a system entirely competitive.

However earnest and thinking men may differ as to the degree in which improvement, moral, intellectual, and physical, has reached the masses of our population, it is a prayer in which all good men unite, that the condition of the working-classes may be more and more improved—that their outward circumstances may be made better and better. But those who labor the steadiest, and the most zealously, in the endeavor to realize this hope, feel that the day of this amelioration is far removed by any contentions between the employed and the employers, which impede production and diminish the funds for the support of labor. They know that every improvement in the arts of life improves also the condition of the humblest working man in the land; and they also know that every successive improvement has a tendency to lessen the inequality in the distribution of wealth. But, if the condition of the working men of this country is to be permanently improved—if they are to obtain a full share of the blessings which science and industry confer upon mankind—they must win those blessings by their own moral elevation. They can not snatch them by violence; they can not accomplish them suddenly by clamor; they can not overthrow a thousand opposing circumstances to a great and rapid rise of wages; they must win them by peaceful and steady exertion. When the working men of this country shall feel, as the larger portion of them already feel, that knowledge is power, they will next set about to see how that power shall be exercised. The first tyranny which that power must hold in check is the tyranny of evil habits—those habits which, looking only to the present hour, at one time plunge some into all the thoughtless extravagance which belongs to a state of high

wages—at another, throw them prostrate before their employers, in all the misery and degradation which accompany a state of low wages, without a provision for that state. It is for them, and for them alone, to equalize the two conditions. The changes of trade, in a highly commercial country like this, must be incessant. It is for the workmen themselves to put a “*governor*” on the commercial machine, as far as they are concerned; in a season of prosperity to accumulate the power of capital—in a season of adversity to use effectively, because temperately, that power which they have won for themselves.

But there are other duties to be performed, in another direction—the duties of employers. That duty does not consist in making laborers partners, if the employers have no inclination thereto. It does not consist in attempting any private benevolence, by raising the rate of wages paid by their own firms beyond the average rate, which attempt would be ruinous to both classes interested. But it does consist in exercising the means within their power to benefit the condition of all in their employ, by cultivating every sympathy with them that may be the real expression of a community of interests. Such sympathy is manifested when large firms devote a considerable portion of their profits to the education of the young persons employed in their factories; when they cultivate the intelligent pleasures of their adult work-people; when, in a word, they make the factory system a beautiful instrument for raising the whole body of their laborers into a real equality, in all the moral and intellectual conditions of our nature, with themselves, the captains of industry. When these duties are attended to, there may be common misfortunes; demand may fall off; the machinery, whether of steam or of mind, may be imperfectly in action; the season of adversity may bring discomfort. But it will not bring animosity. There may be deep anxie-

ties on one part, and severe privations on the other, but there will not be hatred and jealousies—the cold neglect, and the grim despair.

“We know the arduous strife, the eternal laws,
To which the triumph of all good is given ;
High sacrifice, and labor without pause,
Even to the death.”

In concluding this little volume, the object of which has been to illustrate the productive forces of modern society, and the results which have been attained by the combined effects of labor, capital, and skill, we would direct the attention of our readers to the following extract from an address recently delivered before a Mechanics' Association by Prof. Joseph Henry, of the Smithsonian Institution; in which the industrial progress of our race, past and present, is briefly sketched, and the responsibilities which devolve upon each member of society as participators of the benefits of such progress, are pointed out :

“Every age of the world, since the commencement of the historic period, has been characterized by some leading or dominant idea ; and each age has bequeathed something of value to, or made some biding impression on, that which followed. We doubt whether any great and important truth has ever been lost ; and, though some may have apparently lain dormant for a time, yet they have continually produced results. Some arts have undoubtedly fallen into disuse, because they are no longer required, or because they have been superseded by more perfect processes. We, however, think it can be clearly established that modern science is capable of reproducing every invention of ancient art, and at an indefinite economy of human time and human labor.

“I know we are frequently referred to the immense masses

of stone transported and wrought by ancient art, which are found among the ruins of Baalbec and Thebes, and are frequently told that the management of these would far transcend the skill and power of modern engineers. Such assertions are, however, rather intended to convey an idea of the impression produced upon the beholder of these venerable ruins than a declaration of absolute truth. As a sufficient illustration of this, we may mention the fact that, in New York, large buildings of brick and stone are moved from place to place, while the inhabitants remain undisturbed within. Or we may point to the Menai Strait tubular bridge, a structure of cast-iron many hundred tons in weight, suspended in mid-air over a chasm several hundred feet deep.

"I have said that no arts of importance have been lost, but perhaps this assertion is rather too general. There is one which may be considered an exception—I allude to the ancient art possessed by the few of enslaving and brutalizing the many; the art by which a single individual, invested with the magic of kingly power, was enabled to compel thousands of his subjects, through the course of a long reign, like beasts of burden, to haul materials and heap up piles of huge stones, which might transmit to posterity the fact that a worm like himself had lived and died. The pyramids of Egypt, venerable as they are with the age of accumulated centuries, are melancholy monuments of human degradation, of human vanity, and cruelty.

"There are certain processes of thought which require individual exertion rather than combined effort for their development. There are certain arts in which perfection depends on the genius and skill of the individual rather than on the condition of the race. Such are oratory, poetry, painting, and sculpture. In these if an individual excel, he excels for himself—his skill is not transferable, though his

example may serve to awaken the same taste in many of his cotemporaries and successors. For the development of these arts, the individualism of the Greeks was well adapted, and they were accordingly advanced by this people almost, if not quite, to their maximum state of perfection. We now resort to classic ages for moral sentiments, for illustrations of the true, and for the perfection of the beautiful, but not for a knowledge of the laws of nature, or even for the philosophy of art. The ancients had no acquaintance with science, properly so called. In these remarks I seek not to disparage the past, nor to unduly exalt the present. The character of the world, as it now exhibits itself in its mental and moral development, its knowledge of nature, and its skill in arts, is the result of all the impressions made on it from the earliest dawn of civilization to our own day. In the case of an individual, every impression to which his mind is subjected, either from external nature or his own mental operations, or those of his fellow-men, produces an indelible effect, modifying all the previous impressions, and co-operating with them to form the peculiarities of his mental and moral character. An analogous effect is produced on the whole human family during the ages of its existence.

“The results of the labors of the ancients in the development of the beautiful have not been lost, and will ever remain impressed upon the human mind. The marble of the Parthenon may be reduced to atoms, and these scattered to the winds of heaven, but its form is imperishable. The moderns do not attempt to excel the examples of the fine arts bequeathed to them by the ancients, because it would be idle to attempt to add to that which is perfect, to gild refined gold, or paint the lily. But they have invented tools and processes by which copies of these precious relics may be multiplied indefinitely, with unerring precis-

ion, by the application, not of manual skill, but of physical labor.

"The union of the industrial with the fine arts vastly enlarges the influence of the latter, and enables them to be appreciated, and genius to be admired by millions whom their single productions would never reach. There are at this time more minds enthusiastically alive to the beauty of ancient art than there were in the days of Phidias. Nothing, then, of importance has been here lost; but, on the contrary, much has been gained.

"We have received from the past a rich treasure of knowledge, gathered under difficulties and danger, and elaborated with the thought and the experience of years. Our great object should be to purify this knowledge from error, to reduce it to its essential and simple elements, and to transmit it with the greatest amount of new truth to our successors. We should recollect that accumulated knowledge, like accumulated capital, increases at compound interest, and knowledge thus accelerates its own advance. Each generation is therefore bound to add much more largely to the common stock than that which immediately preceded it.

"By these remarks we do not wish to draw upon ourselves the imputation of advocating the perfectibility of the human race. That there will be, however, continued progress, we can not doubt; but this will not be the result of a blind law of necessity, but of a providential design through individual agency. It is, therefore, the high privilege, as well as the sacred duty, of every one of us to make the improvement of ourselves and our fellow-men the great object of life, and to endeavor, to the utmost of our ability, to leave the world at least a little wiser and better than we found it. But, in order to success in this effort, we must cultivate other provinces of

thought than merely those which belong exclusively to the development of our knowledge of the external world. There are other regions of a higher and holier nature, without the cultivation of which no true progress can be made."





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Never before did a private individual make so magnificent an excursion as Mr. Vanderbilt. In a steam yacht of unsurpassed splendor, accompanied by a few select friends, whom he entertained, during the voyage, in the most luxurious manner, he crossed over to the Old World; viewed the curiosities of parts of three continents; steamed from port to port, and then returned, having spent four months in this most delightful manner. Dr. Choutes, who was one of his guests, has given to the world a charming account of this unique voyage, in a beautifully printed and illustrated volume. We commend it to our readers as a very entertaining, well-written book. — *Zion's Herald*.

The whole world has heard of Mr. Vanderbilt and his matchless yacht, — his pleasure excursion to Europe, — its princely cost, and safe and happy execution. * * * The book will be eagerly perused, as a record of one of the unique occurrences of the age; is written with a kind of drawing-room, etiquette-like style, is mellow in sentiment, and is wholly destitute of that straining after the sublime, and stranding in the "high-falutin," that characterize the effusions of the tourist generally. — *Chicago Advertiser*.

This exceedingly clever volume is the result and the record of one of the most stupendous and magnificent water excursions that ever was made. — *Norfolk Op. Democrat*.

This beautiful volume describes, in a chaste and readable manner, the fortunes of the widely-known excursion of the princely New York merchant and his family and guests. From the eclat of the voyage itself, and the pleasant way of Dr. Choutes' account of it, we think the book is destined to have — what it deserves — a very large sale. — *Congregationalist*. (f)

AMOS LAWRENCE.

DIARY AND CORRESPONDENCE OF THE LATE AMOS LAWRENCE; with a brief account of some Incidents in his Life. Edited by his son, WILLIAM R. LAWRENCE, M. D. With fine steel Portraits of AMOS and ABBOTT LAWRENCE, an Engraving of their Birth-place, a Fac-simile page of Mr. Lawrence's Hand-writing, and a copious Index. Octavo edition, cloth, \$1.50. Royal duodecimo edition, \$1.00.

This work was first published in an elegant octavo volume, and sold at the unusually low price of \$1.50. At the solicitation of numerous benevolent individuals who were desirous of circulating the work—so remarkably adapted to do good, especially to young men—*gratuitously*, and of giving those of moderate means, of every class, an opportunity of possessing it, the royal duodecimo, or "*cheap edition*," was issued, varying from the other edition, only in a reduction in the size (allowing less margin), and the *thickness* of the paper.

Within six months after the first publication of this work, *twenty-two thousand* copies had been sold. This extraordinary sale is to be accounted for by the character of the man and the merits of the book. It is the memoir of a Boston merchant, who became distinguished for his great wealth, but more distinguished for the manner in which he used it. It is the memoir of a man, who, commencing business with only \$20, gave away in public and private charities, *during his lifetime* more, probably, than any other person in America. It is substantially an *autobiography*, containing a full account of Mr. Lawrence's career as a merchant, of his various multiplied charities, and of his domestic life.

"We have by us another work, the '*Life of Amos Lawrence*.' We heard it once said in the pulpit, 'There is no work of art like a noble life,' and for that reason he who has achieved one, takes rank with the great artists and becomes the world's property. We are proud of this book. We are willing to let it go forth to other lands as a specimen of what America can produce. In the old world, reviewers have called Barnum the characteristic American man. We are willing enough to admit that he is a characteristic American man; he is one fruit of our soil, but Amos Lawrence is another. Let our country have credit for him also. THE GOOD EFFECT WHICH THIS LIFE MAY HAVE IN DETERMINING THE COURSE OF YOUNG MEN TO HONOR AND VIRTUE IS INCALCULABLE."—MRS. STOWE, IN N. Y. INDEPENDENT.

"We are glad to know that our large business houses are purchasing copies of this work for each of their numerous clerks. Its influence on young men cannot be otherwise than highly salutary. As a business man, Mr. Lawrence was a pattern for the young clerk."—BOSTON TRAVELLER.

"We are thankful for the volume before us. It carries us back to the farm-house of Mr. Lawrence's birth, and the village store of his first apprenticeship. It exhibits a charity noble and active, while the young merchant was still poor. And above all, it reveals to us a beautiful cluster of sister graces, a keen sense of honor, integrity which never knew the shadow of suspicion, candor in the estimate of character, filial piety, rigid fidelity in every domestic relation, and all these connected with and flowing from steadfast religious principle, profound sentiments of devotion, and a vivid realization of spiritual truth."—NORTH AMERICAN REVIEW.

"We are glad that American Biography has been enriched by such a contribution to its treasures. In all that composes the career of 'the good man,' and the practical Christian, we have read few memoirs more full of instruction, or richer in lessons of wisdom and virtue. We cordially unite in the opinion that the publication of this memoir was a duty owed to society."—NATIONAL INTELLIGENCER.

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"This book, besides being of a different class from most biographies, has another peculiar charm. It shows the inside life of the man. You have, as it were, a peep behind the curtain, and see Mr. Lawrence as he went in and out among business men, as he appeared on 'change, as he received his friends, as he poured out, 'with liberal hand and generous heart,' his wealth for the benefit of others, as he received the greetings and salutations of children, and as he appeared in the bosom of his family at his own hearth stone."—BRUNSWICK TELEGRAPH.

"It is printed on new type, the best paper, and is illustrated by four beautiful plates. How it can be sold for the price named is a marvel."—NORFOLK CO. JOURNAL.

"It was first privately printed, and a limited number of copies were distributed among the relatives and near friends of the deceased. This volume was read with the deepest interest by those who were so favored as to obtain a copy, and it passed from friend to friend as rapidly as it could be read. Dr. Lawrence has yielded to the general wish, and made public the volume. It will now be widely circulated, will certainly prove a standard work, and be read over and over again."—BOSTON DAILY ADVERTISER.

VALUABLE WORKS.

KNOWLEDGE IS POWER: A VIEW OF THE PRODUCTIVE FORCES OF MODERN SOCIETY, and the Results of Labor, Capital, and Skill. By CHARLES KNIGHT. American edition, with Additions, by DAVID A. WELLS, Editor of "Annual of Scientific Discovery," etc. With numerous illustrations. 12mo, cloth. \$1.25.

"This work is eminently entitled to be ranked in that class styled 'books for the people.' The author is one of the most popular writers of the day, and has particularly distinguished himself by adapting his books to the masses. Sprung from the people himself, he knows their literary wants, and he knows also how to address them. His style is easy and ready, sufficiently polished for the most refined, while it is peculiarly fitted to captivate plain, unlettered, but thinking men. 'Knowledge is Power' treats of those things which 'come home to the business and bosoms' of every man, which affect the wealth and welfare of both nations and individuals. It is remarkable for its fulness and variety of information, and for the felicity and force with which the author applies his facts to his reasoning. It is as instructive as many books on the same subject *teach* learned men, and as entertaining as it is instructive. The facts and illustrations are drawn from almost every branch of skillful industry—iron-mongery, glass manufacture, pottery, cotton and woollen manufactures, hat making, pin and needle making, printing, etc. It is a work, in short, which the mechanic and artisan of every description will be sure to read with a RELISH. To adapt it to this country, a portion of the industrial, historical and statistical matter, which was exclusively English and local, has been replaced, by the American editor, with information of a like character drawn from American sources. For similar reasons, many of the original engravings have been replaced by others.

MY SCHOOLS AND SCHOOLMASTERS; OR, THE STORY OF MY EDUCATION. By HUGH MILLER, author of "Old Red Sandstone," "Footpaths of the Creator," "My First Impressions of England," etc. 12mo, cloth. \$1.25.

"This autobiography is quite worthy of the renowned author. His first attempts at literature, and his career until he stood forth an acknowledged power among the philosophers and ecclesiastical leaders of his native land, are given without egotism, with a power and vivacity which are equally truthful and delightful."—PRESBYTERIAN.

"Hugh Miller is one of the most remarkable men of the age. Having risen from the humble walks of life, and from the employment of a stone-cutter, to the highest rank among scientific men, everything relating to his history possesses an interest which belongs to that of few living men. There is much even in his school-boy days which points to the man as he now is. The book has all the ease and graphic power which is characteristic of his writings."—NEW YORK OBSERVER.

"This volume is a book for the ten thousand. It is embellished with an admirable likeness of Hugh Miller, the stone mason—his coat off and his sleeves rolled up—with the implements of labor in hand—his form erect, and his eye bright and piercing. The biography of such a man will interest every reader. It is a living thing—teaching a lesson of self-culture of immense value."—PHILADELPHIA CHRISTIAN OBSERVER.

"It is a portion of autobiography exquisitely told. He is a living proof that a single man may contain within himself something more than all the books in the world, some unuttered word, if he will look within and read. This is one of the best books we have had of late, and must have a hearty welcome and a large circulation in America."—LONDON CORRESP. N. Y. TRIBUNE.

"It is a work of rare interest; at times having the fascination of a romance, and again suggesting the profoundest views of education and of science. The ex-mason holds a graphic pen; a quiet humor runs through his pages; he tells a story well, and some of his pictures of home life might almost be classed with *Wilson's*."—NEW YORK INDEPENDENT.

"This autobiography is THE book for poor boys, and others who are struggling with poverty and limited advantages; and perhaps it is not too much to predict that in a few years it will become one of the poor man's classics, filling a space on his scanty shelf next to the *Autobiography of Franklin*."—NEW ENGLAND FARMER.

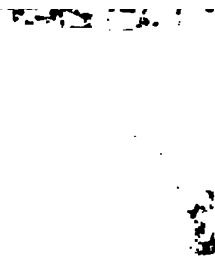
"Lovers of the romantic should not neglect the book, as it contains a narrative of tender passion and happily reciprocated affection, which will be read with subdued emotion and unflinching interest."—BOSTON TRAVELLER.

THE HALLIG; OR, THE SHEEPFOLD IN THE WATERS. A Tale of Humble Life on the Coast of Schleswig. Translated from the German of Biernatowski, by Mrs. GEORGE P. MARSH. With a Biographical Sketch of the Author. 12mo, cloth. \$1.00.

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1. The first part of the paper is devoted to a discussion of the
 2. various methods of determining the rate of reaction.
 3. The second part is devoted to a discussion of the
 4. various methods of determining the order of reaction.
 5. The third part is devoted to a discussion of the
 6. various methods of determining the activation energy.
 7. The fourth part is devoted to a discussion of the
 8. various methods of determining the equilibrium constant.
 9. The fifth part is devoted to a discussion of the
 10. various methods of determining the rate of reaction.



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taken from the Building**

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